

PROJECT MANUAL

**TERRA LINDA HIGH SCHOOL
STUDENT COMMONS
320 NOVA ALBION WAY
SAN RAFAEL, CALIFORNIA 94903**

for

**SAN RAFAEL CITY SCHOOLS
310 NOVA ALBION WAY
SAN RAFAEL, CALIFORNIA, 94903**



**DSA FILE: 21-H1
DSA APPL.: 01-117738
PTN: 65466-27
HED PROJ. NO. 2017-02608**

**DSA APPROVAL
APRIL 2019**

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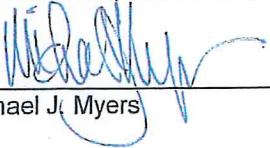
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SEALS PAGE

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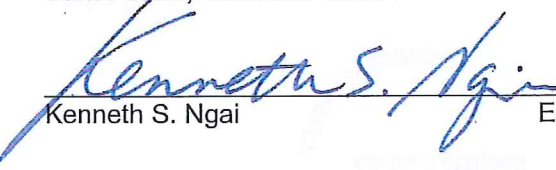
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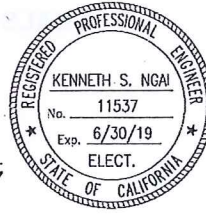


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DEFERRED APPROVAL ITEMS

1. Section 08 44 13 - Glazed Aluminum Curtain Walls, over 10'-0" span.
2. Section 10 71 13 - Exterior Sun Control Devices
3. Section 14 24 00 - Hydraulic Elevators: Elevator Guiderail and support brackets.

For each of the above items, the Contractor, subcontractor or supplier shall provide specifications, specific details, drawings, descriptive materials, shop drawings and structural calculations.

Structural calculations shall be signed by an engineer registered in California.

Fabrication of the above listed items of work shall not be started until detail plans, specifications and engineering calculations have been approved by the Division of the State Architect. Upon receipt of the above material by the Architect, it will be reviewed in detail by the Architect and Structural Engineer of Record for this project. If acceptable, the Architect and Engineer of Record will sign and stamp the materials and submit to the Division of the State Architect for approval. Contractor shall furnish all additional calculations required if the Division of the State Architect requests such additional information.

Contractor shall schedule and give prompt attention to the preparation and submittal of these deferred approval items. Extension of contract time will not be given if project is delayed due to not making submittals in a timely manner.

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FABRIC SHADE STRUCTURE (USA SHADE) PC #04-117140

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END OF DOCUMENT

03/22/10

DOCUMENT 00 11 16

NOTICE TO BIDDERS

1. Notice is hereby given that the governing board ("Board") of the San Rafael City Schools ("District") will receive sealed bids for the following project, Bid No. _____, Bid Package _____ ("Project" or "Contract"):

Terra Linda High School – Student Commons

2. The Project consists of construction of and utility connections for a new Student Commons Building. Scope includes site paving and landscaping.

3. To bid on this Project, the Bidder is required to possess one or more of the following State of California contractors' license(s):

B

The Bidder's license(s) must remain active and in good standing throughout the term of the Contract.

4. To bid on this Project, the Bidder is required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code. The Bidder's registration must remain active throughout the term of the Contract.

5. Contract Documents will be available on or after [Date TBD], 2018, for review at the District Facilities Office. In addition, Contract Documents are available for bidders' review at the following builders' exchanges:

A. Builder's Exchange of Marin County (415) 462 – 1220.

B. Marin IJ website.

C. San Rafael City Schools website.

6. Contract Documents are also available for purchase for _____ dollars (\$_____) at the District Facilities Office. This fee is refundable if the Contract Documents are returned in clean condition back to the District Facilities Office no later than ten (10) calendar days after the date of the bid opening.

7. Sealed bids will be received until 2:00 p.m., _____, 2018, at the District Facilities Office, 310 Nova Albion Way, San Rafael, California 94903, at or after which time the bids will be opened and publicly read aloud. Any bid that is submitted after this time shall be nonresponsive and returned to the bidder. Any claim by a bidder of error in its bid must be made in compliance with section 5100 et seq. of the Public Contract Code.

8. Pursuant to Public Contract Code section 20111.6, only prequalified bidders will be eligible to submit a bid for contracts \$1 million or more using or planning to use state bond funds. Any bid submitted by a bidder who is not prequalified shall be non-responsive and returned unopened to the bidder. Moreover, any bid listing subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43 or C-46 licenses, if used, who have not been prequalified, shall be deemed nonresponsive and will not be considered.

9. All bids shall be on the form provided by the District. Each bid must conform and be responsive to all pertinent Contract Documents, including, but not limited to, the Instructions to Bidders.

10. A bid bond by an admitted surety insurer on the form provided by the District, cash, or a cashier's check or a certified check, drawn to the order of the San Rafael City Schools, in the

amount of ten percent (10%) of the total bid price, shall accompany the Bid Form and Proposal, as a guarantee that the Bidder will, within seven (7) calendar days after the date of the Notice of Award, enter into a contract with the District for the performance of the services as stipulated in the bid.

11. A mandatory pre-bid conference and site visit will be held on [REDACTED], 2018, at 2:00 p.m. at Terra Linda High School, 320 Nova Albion Way, San Rafael, California. All participants are required to sign-in in front of the Administration Building at Terra Linda High School, San Rafael, California. The site visit is expected to take approximately 1 hour. Failure to attend or tardiness will render bid ineligible.
12. The successful Bidder shall be required to furnish a 100% Performance Bond and a 100% Payment Bond if it is awarded the Contract for the Work.
13. Not Used.
14. The successful Bidder may substitute securities for any monies withheld by the District to ensure performance under the Contract, in accordance with the provisions of section 22300 of the Public Contract Code.
15. Not Used.
16. The Contractor and all Subcontractors under the Contractor shall pay all workers on all Work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to section 1770 et seq. of the California Labor Code. Prevailing wage rates are also available from the District or on the Internet at: <<http://www.dir.ca.gov>>.
17. This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and subject to the requirements of Title 8 of the California Code of Regulations. The Contractor and all Subcontractors under the Contractor shall furnish electronic certified payroll records directly to the Labor Commissioner weekly and within ten (10) days of any request by the District or the Labor Commissioner. The successful Bidder shall comply with all requirements of Division 2, Part 7, Chapter 1, Articles 1-5 of the Labor Code.
18. Not Used.
19. Not Used.
20. Not Used.
21. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on:
 - A. The base bid amount only.

END OF DOCUMENT

08/27/18

INSTRUCTIONS TO BIDDERS

Bidders shall follow the instructions in this document, and shall submit all documents, forms, and information required for consideration of a bid.

San Rafael City Schools ("District") will evaluate information submitted by the apparent low Bidder and, if incomplete or unsatisfactory to District, Bidder's bid may be rejected at the sole discretion of District.

1. Bids are requested for a general construction contract, or work described in general, for the following project ("Project" or "Contract"):

Terra Linda High School – Student Commons

2. A Bidder and its subcontractors must possess the appropriate State of California contractors' license and must maintain the license throughout the duration of the project. Bidders must also be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code. Bids submitted by a contractor who is not properly licensed or registered shall be deemed nonresponsive and will not be considered.
3. The District has prequalified bidders pursuant to Public Contract Code section 20111.6 for contracts \$1 million or more using or planning to use state bond funds. Only prequalified bidders will be eligible to submit a bid for this Project. Any bid submitted by a bidder who is not prequalified shall be deemed nonresponsive and will not be considered. Moreover, any bid listing subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43 or C-46 licenses, if used, who have not been prequalified, shall be deemed nonresponsive and will not be considered[A1].
4. District will receive sealed bids from bidders as stipulated in the Notice to Bidders.
 - a. All bids must be sealed in an envelope, marked with the name and address of the Bidder, name of the Project, the Project Number and/or bid number, and time of bid opening.
 - b. Bids must be submitted to the District Office by date and time shown in the Notice to Bidders.
 - c. Bids must contain all documents as required herein.
5. Bidders are advised that on the date that bids are opened, telephones will not be available at the District Offices for use by bidders or their representatives.
6. Bids will be opened at or after the time indicated for receipt of bids.
7. Bidders must submit bids on the documents titled Bid Form and Proposal, and must submit all other required District forms. Bids not submitted on the District's required forms shall be deemed nonresponsive and shall not be considered. Additional sheets required to fully respond to requested information are permissible.
8. Bidders shall not modify the Bid Form and Proposal or qualify their bids. Bidders shall not submit to the District a re-formatted, re-typed, altered, modified, or otherwise recreated version of the Bid Form and Proposal or other District-provided document.
9. Bids shall be clearly written and without erasure or deletions. District reserves the right to reject any bid containing erasures, deletions, or illegible contents.

10. Bidders must supply all information required by each Bid Document. Bids must be full and complete. District reserves the right in its sole discretion to reject any bid as nonresponsive as a result of any error or omission in the bid. Bidders must complete and submit all of the following documents with the Bid Form and Proposal:
 - a. Bid Bond on the District's form, or other security.
 - b. Designated Subcontractors List.
 - c. Site Visit Certification, if a site visit was required.
 - d. Non-Collusion Declaration.
 - e. Iran Contracting Act Certification, if contract value is \$1,000,000 or more[A2].
11. Bidders must submit with their bids cash, a cashier's check or a certified check payable to District, or a bid bond by an admitted surety insurer of not less than ten percent (10%) of amount of Base Bid, plus all additive alternates ("Bid Bond"). If Bidder chooses to provide a Bid Bond as security, Bidder must use the required form of corporate surety provided by District. The Surety on Bidder's Bid Bond must be an insurer admitted in the State of California and authorized to issue surety bonds in the State of California. Bids submitted without necessary bid security will be deemed nonresponsive and will not be considered.
12. If Bidder to whom the Contract is awarded fails or neglects to enter into the Contract and submit required bonds, insurance certificates, and all other required documents, within **SEVEN (7)** calendar days after the date of the Notice of Award, District may deposit Bid Bond, cash, cashier's check, or certified check for collection, and proceeds thereof may be retained by District as liquidated damages for failure of Bidder to enter into Contract, in the sole discretion of District. It is agreed that calculation of damages District may suffer as a result of Bidder's failure to enter into the Contract would be extremely difficult and impractical to determine and that the amount of the Bidder's required bid security shall be the agreed and conclusively presumed amount of damages.
13. Bidders must submit with the bid the Designated Subcontractors List for those subcontractors who will perform any portion of Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent (0.5%) of total bid. Failure to submit this list when required by law shall result in bid being deemed nonresponsive and the bid will not be considered.
14. All of the listed subcontractors are required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code.
 - a. An inadvertent error in listing the California contractor license number on the Designated Subcontractors List shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the correct contractor's license number is submitted to the District within 24 hours after the bid opening and the corrected number corresponds with the submitted name and location for that subcontractor.
 - b. An inadvertent error listing an unregistered subcontractor shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive provided that any of the following apply:
 - (1) The subcontractor is registered prior to the bid opening.
 - (2) The subcontractor is registered and has paid the penalty registration fee within 24 hours after the bid opening.

- (3) The subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
15. If a mandatory pre-bid conference and site visit ("Site Visit") is required as referenced in the Notice to Bidders, then Bidders must submit the Site Visit Certification with their Bid. District will transmit to all prospective Bidders of record such Addenda as District in its discretion considers necessary in response to questions arising at the Site Visit. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda issued by the District as a result of the Site Visit, if any, shall constitute the sole and exclusive record and statement of the results of the Site Visit.
16. Bidders shall submit the Non-Collusion Declaration with their bids. Bids submitted without the Non-Collusion Declaration shall be deemed nonresponsive and will not be considered.
17. The Contractor and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to the Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the Department of Industrial Relations, are available upon request at the District's principal office. Prevailing wage rates are also available on the internet at <http://www.dir.ca.gov>.
18. Not Used. [A3] .
19. Section 17076.11 of the Education Code requires school districts using funds allocated pursuant to the State of California School Facility Program for the construction and/or modernization of school building(s) to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%) per year of the overall dollar amount expended on projects that receive state funding or demonstrate its good faith effort to solicit DVBE participation in this Contract. In order to meet this requirement by demonstrating a good faith effort, Bidder must advertise for DVBE-certified subcontractors and suppliers before submitting its Bid. For any project that is at least partially state-funded, the lowest responsive responsible Bidder awarded the Contract must submit certification of compliance with the procedures for implementation of DVBE contracting goals with its signed Agreement. DVBE Certification form is attached. Do not submit this form with your Bid[A4][A5].
20. Submission of bid signifies careful examination of Contract Documents and complete understanding of the nature, extent, and location of Work to be performed. Bidders must complete the tasks listed below as a condition to bidding, and submission of a bid shall constitute the Bidder's express representation to District that Bidder has fully completed the following:
- a. Bidder has visited the Site, if required, and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as-built conditions, and all local conditions and federal, state and local laws, and regulations that in any manner may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;
 - b. Bidder has conducted or obtained and has understood all examinations, investigations, explorations, tests, reports, and studies that pertain to the subsurface conditions, as-built conditions, underground facilities, and all other physical conditions at or contiguous to the Site or otherwise that may affect the cost, progress, performance, or furnishing of Work, as Bidder considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time, and in accordance with the other

terms and conditions of Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies, or similar information or data are or will be required by Bidder for such purposes;

- c. Bidder has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents;
- d. Bidder has given the District prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents and the actual conditions, and the written resolution(s) thereof by the District is/are acceptable to Bidder;
- e. Bidder has made a complete disclosure in writing to the District of all facts bearing upon any possible interest, direct or indirect, that Bidder believes any representative of the District or other officer or employee of the District presently has or will have in this Contract or in the performance thereof or in any portion of the profits thereof;
- f. Bidder must, prior to bidding, perform the work, investigations, research, and analysis required by this document and that Bidder represented in its Bid Form and Proposal and the Agreement that it performed prior to bidding. Contractor under this Contract is charged with all information and knowledge that a reasonable bidder would ascertain from having performed this required work, investigation, research, and analysis. Bid prices must include entire cost of all work "incidental" to completion of the Work.
- g. Conditions Shown on the Contract Documents: Information as to underground conditions, as-built conditions, or other conditions or obstructions, indicated in the Contract Documents, e.g., on Drawings or in Specifications, has been obtained with reasonable care, and has been recorded in good faith. However, District only warrants, and Bidder may only rely, on the accuracy of limited types of information.
 - (1) As to above-ground conditions or as-built conditions shown or indicated in the Contract Documents, there is no warranty, express or implied, or any representation express or implied, that such information is correctly shown or indicated. This information is verifiable by independent investigation and Bidder is required to make such verification as a condition to bidding. In submitting its Bid, Bidder shall rely on the results of its own independent investigation. In submitting its Bid, Bidder shall not rely on District-supplied information regarding above-ground conditions or as-built conditions.
 - (2) As to any subsurface condition shown or indicated in the Contract Documents, Bidder may rely only upon the general accuracy of actual reported depths, actual reported character of materials, actual reported soil types, actual reported water conditions, or actual obstructions shown or indicated. District is not responsible for the completeness of such information for bidding or construction; nor is District responsible in any way for any conclusions or opinions that the Bidder has drawn from such information; nor is the District responsible for subsurface conditions that are not specifically shown (for example, District is not responsible for soil conditions in areas contiguous to areas where a subsurface condition is shown).
- h. Conditions Shown in Reports and Drawings Supplied for Informational Purposes: Reference is made to the document entitled Geotechnical Data, and the document entitled Existing Conditions, for identification of:
 - (1) Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by Architect in preparing the Contract Documents; and

- (2) Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that has been utilized by Architect in preparing the Contract Documents.
- (3) These reports and drawings are **not** Contract Documents and, except for any "technical" data regarding subsurface conditions specifically identified in Geotechnical Data and Existing Conditions, and underground facilities data, Bidder may not in any manner rely on the information in these reports and drawings. Subject to the foregoing, Bidder must make its own independent investigation of all conditions affecting the Work and must not rely on information provided by District.
21. Bids shall be based on products and systems specified in Contract Documents or listed by name in Addenda. Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Bidder may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified. The District is not responsible and/or liable in any way for a Contractor's damages and/or claims related, in any way, to that Contractor's basing its bid on any requested substitution that the District has not approved in advance and in writing. Contractors and materials suppliers who submit requests for substitutions prior to the award of the Contract must do so in writing and in compliance with Public Contract Code section 3400. All requests must comply with the following:
- a. District must receive any notice of request for substitution of a specified item a minimum of **TEN (10)** calendar days prior to bid opening. The Successful Bidder will not be allowed to substitute specified items unless properly noticed.
 - b. Within 35 days after the date of the Notice of Award, the Successful Bidder shall submit data substantiating the request(s) for all substitution(s) containing sufficient information to assess acceptability of product or system and impact on Project, including, without limitation, the requirements specified in the Special Conditions and the Specifications. Insufficient information shall be grounds for rejection of substitution.
 - c. Approved substitutions, if any, shall be listed in Addenda. District reserves the right not to act upon submittals of substitutions until after bid opening.
 - d. Substitutions may be requested after Contract has been awarded only if indicated in and in accordance with requirements specified in the Special Conditions and the Specifications.
22. Bidders may examine any available "as-built" drawings of previous work by giving District reasonable advance notice. District will not be responsible for accuracy of "as-built" drawings. The document entitled Existing Conditions applies to all supplied "as-built" drawings.
23. All questions about the meaning or intent of the Contract Documents are to be directed via email to the District to Hector DeLeon, hector.deleon@vpcsonline.com and Dan Zaich (Senior Director Capital Facilities) dzaich@srcs.org; 310 Nova Albion Way, Sana Rafael, CA 94903; on or before Tuesday, [REDACTED], 2018 at 2:00 P.M [A6]. Interpretations or clarifications considered necessary by the District in response to such questions will be issued in writing by Addenda and emailed, faxed, mailed, or delivered to all parties recorded by the District as having received the Contract Documents or posted on the District's website. Responses will be emailed and posted on the District website by 2:00 P.M. on Tuesday [REDACTED], 2018.[A7]. Questions received less than **SEVEN (7)** calendar days prior to the date for opening bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
24. Addenda may also be issued to modify other parts of the Contract Documents as deemed advisable by the District.

25. Each Bidder must acknowledge each Addendum in its Bid Form and Proposal by number or its Bid shall be considered non-responsive. Each Addendum shall be part of the Contract Documents. A complete listing of Addenda may be secured from the District.
26. This Contract may include alternates. Alternates are defined as alternate products, materials, equipment, systems, methods, or major elements of the construction that may, at the District's option and under terms established in the Contract and pursuant to section 20103.8 of the Public Contract Code, be selected for the Work.
27. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on the criteria as indicated in the Notice to Bidders. In the event two or more responsible bidders submit identical bids, the District shall select the Bidder to whom to award the Contract by lot.
28. Time for Completion: District may issue a Notice to Proceed within **NINETY (90)** days from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.
- a. In the event that the District desires to postpone issuing the Notice to Proceed beyond this 90-day period, it is expressly understood that with reasonable notice to the Contractor, the District may postpone issuing the Notice to Proceed.
 - b. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed beyond a 90-day period. If the Contractor believes that a postponement of issuance of the Notice to Proceed will cause a hardship to the Contractor, the Contractor may terminate the Contract. Contractor's termination due to a postponement beyond this 90-day period shall be by written notice to District within **TEN (10)** calendar days after receipt by Contractor of District's notice of postponement.
 - c. It is further understood by the Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement and which the District had in writing authorized Contractor to perform prior to issuing a Notice to Proceed.
 - d. Should the Contractor terminate the Contract as a result of a notice of postponement, District shall have the authority to award the Contract to the next lowest responsive responsible bidder.
29. The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7th)** calendar day following the date of the Notice of Award. Failure to properly and timely submit these documents entitles District to reject the bid as nonresponsive.
- a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.
 - b. Escrow of Bid Documentation: This must include all required documentation. See the document titled Escrow Bid Documentation for more information.
 - c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
 - d. Payment Bond (Contractor's Labor and Material Bond) (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
 - e. Insurance Certificates and Endorsements as required.

- f. Workers' Compensation Certification.
 - g. Prevailing Wage and Related Labor Requirements Certification.
 - h. Not Used.[A8].
 - i. Drug-Free Workplace Certification[A9].
 - j. Tobacco-Free Environment Certification[A10].
 - k. Hazardous Materials Certification[A11].
 - l. Lead-Based Materials Certification[A12].
 - m. Not Used.[A13].
 - n. Criminal Background Investigation/Fingerprinting Certification.
 - o. Not Used.[A14].
 - p. Not Used. [A15].
 - q. Registered Subcontractors List: Must include Department of Industrial Relations (DIR) registration number of each subcontractor for all tiers.
30. Any bid protest by any Bidder regarding any other bid must be submitted in writing to the District, before 5:00 p.m. of the **THIRD (3rd)** business day following bid opening.
- a. Only a Bidder who has actually submitted a bid, and who could be awarded the Contract if the bid protest is upheld, is eligible to submit a bid protest. Subcontractors are not eligible to submit bid protests. A Bidder may not rely on the bid protest submitted by another Bidder.
 - b. A bid protest must contain a complete statement of any and all bases for the protest and all supporting documentation. Materials submitted after the bid protest deadline will not be considered.
 - c. The protest must refer to the specific portions of all documents that form the basis for the protest.
 - (1) Without limitation to any other basis for protest, an inadvertent error in listing the California contractor's license number on the Designated Subcontractors List shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the correct contractor's license number is submitted to the District within 24 hours after the bid opening and the corrected number corresponds with the submitted name and location for that subcontractor.
 - (2) Without limitation to any other basis for protest, an inadvertent error listing an unregistered subcontractor shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive provided that any of the following apply:
 - (i) The subcontractor is registered prior to the bid opening.
 - (ii) The subcontractor is registered and has paid the penalty registration fee within 24 hours after the bid opening.
 - (iii) The subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.

- d. The protest must include the name, address and telephone number of the person representing the protesting party.
 - e. The party filing the protest must concurrently transmit a copy of the protest and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other bidders or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
 - f. The procedure and time limits set forth in this paragraph are mandatory and are each bidder's sole and exclusive remedy in the event of bid protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.
31. District reserves the right to reject any or all bids, including without limitation the right to reject any or all nonconforming, nonresponsive, unbalanced, or conditional bids, to re-bid, and to reject the bid of any bidder if District believes that it would not be in the best interest of the District to make an award to that bidder, whether because the bid is not responsive or the bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by District. District also reserves the right to waive any inconsequential deviations or irregularities in any bid. For purposes of this paragraph, an "unbalanced bid" is one having nominal prices for some work items and/or enhanced prices for other work items.
32. Discrepancies between written words and figures, or words and numerals, will be resolved in favor of figures or numerals.
33. It is the policy of the District that no qualified person shall be excluded from participating in, be denied the benefits of, or otherwise be subjected to discrimination in any consideration leading to the award of contract, based on race, color, gender, sexual orientation, political affiliation, age, ancestry, religion, marital status, national origin, medical condition or disability. The Successful Bidder and its subcontractors shall comply with applicable federal and state laws, including, but not limited to the California Fair Employment and Housing Act, beginning with Government Code section 12900, and Labor Code section 1735.
34. Prior to the award of Contract, District reserves the right to consider the responsibility of the Bidder. District may conduct investigations as District deems necessary to assist in the evaluation of any bid and to establish the responsibility, including, without limitation, qualifications and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to District's satisfaction within the prescribed time.

END OF DOCUMENT

08/27/18

DOCUMENT 00 21 13.1

BIDDER INFORMATION AND FORMS

[INTENTIONALLY LEFT BLANK UNLESS PROVIDED IN SPECIAL CONDITIONS
– SEPARATE PREQUALIFICATION PROCESS RECOMMENDED]

END OF DOCUMENT

08/27/18

EXISTING CONDITIONS

1. SUMMARY

This document describes existing conditions at or near the Project, and use of information available regarding existing conditions. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. REPORTS AND INFORMATION ON EXISTING CONDITIONS

- a. Documents providing a general description of the Site and conditions of the Work may have been collected by San Rafael City Schools ("District"), its consultants, contractors, and tenants. These documents may, but are not required to, include previous contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding underground facilities.
- b. Information regarding existing conditions may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports, documents, and other information are **not** part of the Contract Documents. These reports, documents, and other information do **not** excuse Contractor from fulfilling Contractor's obligation to independently investigate any or all existing conditions or from using reasonable prudent measures to avoid damaging existing improvements.
- c. Information regarding existing conditions may also be included in the Project Manual, but shall **not** be considered part of the Contract Documents.
- d. Prior to commencing this Work, Contractor and the District's representative shall survey the Site to document the condition of the Site. Contractor will record the survey in digital videotape format and provide an electronic copy to the District within fourteen (14) days of the survey.
- e. Contractor may also document any pre-existing conditions in writing, provided that both the Contractor and the District's representative agree on said conditions and sign a memorandum documenting the same.
- f. The reports and other data or information regarding existing conditions and underground facilities at or contiguous to the Project are the following:
 - (1) Original Construction Drawings.
 - (2) Survey of Site.
 - (3) Geotechnical Report(s).
 - (4) Hazardous Material Report(s).
 - (5) Crossbore Logs & Mapping.

3. USE OF INFORMATION

- a. Information regarding existing conditions was obtained only for use of District and its consultants, contractors, and tenants for planning and design and is **not** part of the Contract Documents.
- b. District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any information regarding existing conditions. Bidder represents and agrees that in submitting a bid it is not relying on any information regarding existing conditions supplied by District.

- c. Under no circumstances shall District be deemed to warrant or represent existing above-ground conditions, as-built conditions, or other actual conditions, verifiable by independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder must perform as a condition to bidding and Bidder should not and shall not rely on this information or any other information supplied by District regarding existing conditions.
- d. Any information shown or indicated in the reports and other data supplied herein with respect to existing underground facilities at or contiguous to the Project may be based upon information and data furnished to District by the District's employees and/or consultants or builders of such underground facilities or others. District does not assume responsibility for the completeness of this information, and Bidder is solely responsible for any interpretation or conclusion drawn from this information.
- e. District shall be responsible only for the general accuracy of information regarding underground facilities, and only for those underground facilities that are owned by District, and only where Bidder has conducted the independent investigation required of it pursuant to the Instructions to Bidders, and discrepancies are not apparent.

4. INVESTIGATIONS/SITE EXAMINATIONS

- a. Before submitting a bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.
- b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

04/01/19

EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A Limited Pre-Renovation Hazardous Materials Report, prepared by Terracon Consultants, Inc., dated February 5, 2018, is available for viewing at the office of the Construction Manager.
- C. Related Requirements:
 - 1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 00 31 32 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT

09/21/18

GEOTECHNICAL DATA

1. SUMMARY

This document describes geotechnical data at or near the Project that is in the District's possession available for Contractor's review, and use of data resulting from various investigations. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. GEOTECHNICAL REPORTS

- A. Geotechnical reports may have been prepared for and around the Site and/or in connection with the Work by soil investigation engineers hired by San Rafael City Schools ("District"), and its consultants, contractors, and tenants.
- B. Geotechnical reports may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports are **not** part of the Contract Documents.
- C. The reports and drawings of physical conditions that may relate to the Project are the following:

Design Level Geotechnical Investigation and
Geologic Hazards Study Report
Terra Linda High School
320 Nova Albion Way
San Rafael, Marin County, California

Prepared by: A3GEO, Inc.
Date: February 16, 2018

3. USE OF DATA

- A. Geotechnical data were obtained only for use of District and its consultants, contractors, and tenants for planning and design and are **not** a part of Contract Documents.
- B. Except as expressly set forth below, District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any geotechnical data. Bidder represents and agrees that in submitting a Bid it is not relying on any geotechnical data supplied by District, except as specifically allowed below.
- C. Under no circumstances shall District be deemed to make a warranty or representation of existing above ground conditions, as-built conditions, geotechnical conditions, or other actual conditions verifiable by independent investigation. These conditions are verifiable by Contractor by the performance of its own independent investigation that Contractor should perform as a condition to bidding and Contractor must not and shall not rely on information supplied by District.

4. LIMITED RELIANCE PERMITTED ON CERTAIN INFORMATION

A. Reference is made herein for identification of:

Reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by District in preparation of the Contract Documents.

Drawings of physical conditions in or relating to existing subsurface structures (except underground facilities) that are at or contiguous to the Site and have been utilized by District in preparation of the Contract Documents.

B. Bidder may rely upon the general accuracy of the “technical data” contained in the reports and drawings identified above, but only insofar as it relates to subsurface conditions, provided Bidder has conducted the independent investigation required pursuant to Instructions to Bidders, and discrepancies are not apparent. The term “technical data” in the referenced reports and drawings shall be limited as follows:

- 1) The term “technical data” shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment or structures that were encountered during subsurface exploration. The term “technical data” does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures.
- 2) The term “technical data” shall not include the location of underground facilities.
- 3) Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder may rely upon the general accuracy of the “technical data” contained in such reports or drawings.
- 4) Bidder is solely responsible for any interpretation or conclusion drawn from any “technical data” or any other data, interpretations, opinions, or information provided in the identified reports and drawings.

5. INVESTIGATIONS/SITE EXAMINATIONS

A. Before submitting a Bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.

B. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

08/27/18

BID FORM AND PROPOSAL

To: Governing Board of the San Rafael City Schools ("District" or "Owner")

From: _____
(Proper Name of Bidder)

The undersigned declares that Bidder has read and understands the Contract Documents, including, without limitation, the Notice to Bidders and the Instructions to Bidders, and agrees and proposes to furnish all necessary labor, materials, and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of Bid No. _____.

PROJECT: Terra Linda High School – Student Commons.

("Project" or "Contract") and will accept in full payment for that Work the following total lump sum amount, all taxes included:

_____ dollars \$ _____
BASE BID
<i>Bidder acknowledges and agrees that the Base Bid accounts for any and all Allowance(s), and Total Cost for Unit Prices.</i>

Additive Alternates:

Alternate #1 -

_____ dollars \$ _____
Additive

Alternate #2 –

_____ dollars \$ _____
Additive

Descriptions of alternates are primarily scope definitions and do not necessarily detail the full range of materials and processes needed to complete the construction.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

Additional Detail Regarding Calculation of Base Bid

1. Unit Prices: Not Used.
2. **Allowance.** The Bidder's Base Bid and each alternate shall include a ten percent (10%) allowance for unforeseen items.

The above allowance shall only be allocated for unforeseen items relating to the Work. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared an Allowance Expenditure Directive incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive change order at or near the end of the Project for all or any portion of the allowance not allocated.

3. OCIP: Not Used.
4. The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Proposal, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to the District, and agrees that its Proposal, if accepted by the District, will be the basis for the Bidder to enter into a contract with the District in accordance with the intent of the Contract Documents.
5. The undersigned has notified the District in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract Documents, and has contacted the Construction Manager before bid date to verify the issuance of any clarifying Addenda.
6. The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.
7. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.
8. It is understood that the District reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.
9. The following documents are attached hereto:
 - Bid Bond on the District's form or other security
 - Designated Subcontractors List
 - Site Visit Certification
 - Non-Collusion Declaration
 - Iran Contracting Act Certification

10. Receipt and acceptance of the following Addenda is hereby acknowledged:

No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____

11. Bidder acknowledges that the license required for performance of the Work is a _____ license.
12. The undersigned hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.
13. Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with all requirements of the Department of Industrial Relations.
14. Bidder hereby certifies that its bid includes sufficient funds to permit Bidder to comply with all local, state or federal labor laws or regulations during the Project, including payment of prevailing wage, and that Bidder will comply with the provisions of Labor Code section 2810(d) if awarded the Contract.
15. Not Used.
16. Not Used.
17. The Bidder represents that it is competent, knowledgeable, and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.
18. Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.
19. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Gov. Code, § 12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.
20. The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the Contract, licensed by the State of California to do the type of work required under the terms of the Contract Documents and registered as a public works contractor with the Department of Industrial Relations. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

Furthermore, Bidder hereby certifies to the District that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury.

Dated this _____ day of _____ 2019

Name of Bidder: _____

Type of Organization: _____

Signed by: _____

Title of Signer: _____

Address of Bidder: _____

Taxpayer Identification No. of Bidder: _____

Telephone Number: _____

Fax Number: _____

E-mail: _____ Web Page: _____

Contractor's License No(s): No.: _____ Class: _____ Expiration Date: _____

 No.: _____ Class: _____ Expiration Date: _____

 No.: _____ Class: _____ Expiration Date: _____

Public Works Contractor Registration No.: _____

END OF DOCUMENT

04/02/19

BID BOND

(Note: If Bidder is providing a bid bond as its bid security, Bidder must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That the undersigned, _____, as Principal ("Principal"),

and _____, as Surety ("Surety"), a corporation organized and existing under and by virtue of the laws of the State of California and authorized to do business as a surety in the State of California, are held and firmly bound unto the San Rafael City Schools ("District") of Marin County, State of California, as Obligee, in an amount equal to ten percent (10%) of the Base Bid plus alternates, in the sum of

_____ Dollars (\$ _____)

lawful money of the United States of America, for the payment of which sum well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted a bid to the District for all Work specifically described in the accompanying bid for the following project: Terra Linda High School – Student Commons ("Project" or "Contract").

NOW, THEREFORE, if the Principal is awarded the Contract and, within the time and manner required under the Contract Documents, after the prescribed forms are presented to Principal for signature, enters into a written contract, in the prescribed form in accordance with the bid, and files two bonds, one guaranteeing faithful performance and the other guaranteeing payment for labor and materials as required by law, and meets all other conditions to the Contract between the Principal and the Obligee becoming effective, or if the Principal shall fully reimburse and save harmless the Obligee from any damage sustained by the Obligee through failure of the Principal to enter into the written contract and to file the required performance and labor and material bonds, and to meet all other conditions to the Contract between the Principal and the Obligee becoming effective, then this obligation shall be null and void; otherwise, it shall be and remain in full force and effect. The full payment of the sum stated above shall be due immediately if Principal fails to execute the Contract within seven (7) days of the date of the District's Notice of Award to Principal.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or the call for bids, or to the work to be performed thereunder, or the specifications accompanying the same, shall in any way affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or the call for bids, or to the work, or to the specifications.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorneys' fee to be fixed by the Court.

If the District awards the bid, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on the _____ day of _____, 20____.

Principal

By

Surety

By

Name of California Agent of Surety

Address of California Agent of Surety

Telephone Number of California Agent of Surety

Bidder must attach Power of Attorney and Certificate of Authority for Surety and a Notarial Acknowledgment for all Surety's signatures. The California Department of Insurance must authorize the Surety to be an admitted Surety Insurer.

END OF DOCUMENT

04/01/19

DESIGNATED SUBCONTRACTORS LIST
(Public Contact Code Sections 4100-4114)

PROJECT: Terra Linda High School – Student Commons

Bidder acknowledges and agrees that it must clearly set forth below the name, location and California contractor license number of each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the Work or who will specially fabricate and install a portion of the Work according to detailed drawings contained in the plans and specifications in an amount in excess of one-half of one percent (0.5%) of Bidder's total Base Bid and the kind of Work that each will perform. Vendors or suppliers of materials only do not need to be listed.

Bidder acknowledges and agrees that, if Bidder fails to list as to any portion of Work, or if Bidder lists more than one subcontractor to perform the same portion of Work, Bidder must perform that portion itself or be subjected to penalty under applicable law. In case more than one subcontractor is named for the same kind of Work, state the portion of the kind of Work that each subcontractor will perform.

If alternate bid(s) is/are called for and Bidder intends to use subcontractors different from or in addition to those subcontractors listed for work under the Base Bid, Bidder must list subcontractors that will perform Work in an amount in excess of one half of one percent (0.5%) of Bidder's total Base Bid plus alternate(s).

If further space is required for the list of proposed subcontractors, attach additional copies of page 2 showing the required information, as indicated below.

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

SITE VISIT CERTIFICATION

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID
IF SITE VISIT WAS MANDATORY

PROJECT: Terra Linda High School – Student Commons

Check option that applies:

_____ I certify that I visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. I fully understand the facilities, difficulties, and restrictions attending the execution of the Work under contract.

_____ I certify that _____ (Bidder's representative) visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. The Bidder's representative fully understood the facilities, difficulties, and restrictions attending the execution of the Work under contract.

Bidder fully indemnifies the San Rafael City Schools, its Architect, its Engineer, its Construction Manager, and all of their respective officers, agents, employees, and consultants from any damage, or omissions, related to conditions that could have been identified during my visit and/or the Bidder's representative's visit to the Site.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

ATTACHMENTS:

- 1.
- 2.
- 3.

END OF DOCUMENT

04/01/19

**NON-COLLUSION DECLARATION
(Public Contract Code Section 7106)**

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid.
[Title] [Name of Firm]

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____,
[Date]

at _____, _____.
[City] [State]

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

IRAN CONTRACTING ACT CERTIFICATION
(Public Contract Code Sections 2202-2208)

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

Prior to bidding on or submitting a proposal for a contract for goods or services of \$1,000,000 or more, the bidder/proposer must submit this certification pursuant to Public Contract Code section 2204.

The bidder/proposer must complete **ONLY ONE** of the following two options. To complete OPTION 1, check the corresponding box **and** complete the certification below. To complete OPTION 2, check the corresponding box, complete the certification below, and attach documentation demonstrating the exemption approval.

- ☐ **OPTION 1.** Bidder/Proposer is not on the current list of persons engaged in investment activities in Iran created by the California Department of General Services ("DGS") pursuant to Public Contract Code section 2203(b), and we are not a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person, for 45 days or more, if that other person will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS.
- ☐ **OPTION 2.** Bidder/Proposer has received a written exemption from the certification requirement pursuant to Public Contract Code sections 2203(c) and (d). *A copy of the written documentation demonstrating the exemption approval is included with our bid/proposal.*

CERTIFICATION:

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY, that I am duly authorized to legally bind the bidder/proposer to the OPTION selected above. This certification is made under the laws of the State of California.

<i>Vendor Name/Financial Institution (Printed)</i>	<i>Federal ID Number (or n/a)</i>
<i>By (Authorized Signature)</i>	
<i>Printed Name and Title of Person Signing</i>	<i>Date Executed</i>

END OF DOCUMENT

08/27/18

WORKERS' COMPENSATION CERTIFICATION

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools
("District") and _____ ("Contractor" or "Bidder")
("Contract" or "Project").

Labor Code section 3700, in relevant part, provides:

Every employer except the State shall secure the payment of compensation in one or more of the following ways:

- a. By being insured against liability to pay compensation by one or more insurers duly authorized to write compensation insurance in this state; and/or
- b. By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his employees.

I am aware of the provisions of section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

(In accordance with Labor Code sections 1860 and 1861, the above certificate must be signed and filed with the awarding body prior to performing any Work under this Contract.)

END OF DOCUMENT

08/27/18

**DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION CERTIFICATION**

PROJECT/CONTRACT NO.: _____ between the San Rafael City Schools ("District") and _____
 _____ ("Contractor" or "Bidder") ("Contract" or "Project").

GENERAL INSTRUCTIONS

Section 17076.11 of the Education Code requires school districts using, or planning to use, funds allocated pursuant to the State of California School Facility Program ("Program") for the construction and/or modernization of school buildings to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%) per year of the overall dollar amount expended each year by the school district on projects that receive state funding. Therefore, the lowest responsive responsible Bidder awarded the Contract must submit this document to the District with its executed Agreement, identifying the steps contractor took to solicit DVBE participation in conjunction with this Contract. **Do not submit this form with your bids.**

PART I – Method of Compliance with DVBE Participation Goals. Check the appropriate box to indicate your method of committing the contract dollar amount.

YOUR BUSINESS ENTERPRISE IS:	AND YOU WILL	AND YOU WILL
A. <input type="checkbox"/> Disabled veteran owned and your forces will perform at least 3% of this Contract	Include a copy of your DVBE letter from Office of Small Business and Disabled Veterans Business Enterprise Services ("OSDS")*	Complete Part 1 of this form and the Certification
B. <input type="checkbox"/> Disabled veteran owned but is unable to perform 3% of this Contract with your forces	Use DVBE subcontractors /suppliers to bring the Contract participation to at least 3%	Include a copy of each DVBE's letter from OSDS (including yours, if applicable), and complete Part 1 of this form and the Certification
C. <input type="checkbox"/> NOT disabled veteran owned	Use DVBE subcontractors /suppliers for at least 3% of this Contract	
D. <input type="checkbox"/> Unable to meet the required participation goals	Complete all of this form and the Certification	

* A DVBE letter from OSDS is obtained from the participating DVBE.

You must complete the following table to show the dollar amount of DVBE participation:

	TOTAL CONTRACT PRICE
A. Prime Bidder, if DVBE (own participation)	\$
B. DVBE Subcontractor or Supplier	
1.	
2.	
3.	
4.	
C. Subtotal (A & B)	
D. Non-DVBE	
E. Total Bid	

PART II – Contacts. To identify DVBE subcontractors/suppliers for participation in your contract, you must contact each of the following categories. You should contact several DVBE organizations.

CATEGORY	TELEPHONE NUMBER	DATE CONTACTED	PERSON CONTACTED
1. The District, if any			*
2. OSDS, provides assistance locating DVBEs at https://caleprocure.ca.gov/pages/PublicSearch/supplier-search.aspx	(916) 375-4940		*
3. DVBE Organization (List)			*

*Write “recorded message” in this column, if applicable.

PART III – Advertisement. You must advertise for DVBE participation in both a trade and focus paper. List the advertisement you place to solicit DVBE participation. Advertisements should be published at least fourteen (14) days prior to bid/proposal opening; if you cannot advertise fourteen (14) days prior, advertisements should be published as soon as possible. Advertisements must include that your firm is seeking DVBE participation, the project name and location, and your firm’s name, your contact person, and telephone number. Attach copies of advertisements to this form.

FOCUS/TRADE PAPER NAME	CHECK ONE		DATE OF ADVERTISEMENT
	TRADE	FOCUS	

PART IV – DVBE Solicitations. List DVBE subcontractors/suppliers that were invited to bid. Use the following instructions to complete the remainder of this section (read the three columns as a sentence from left to right). If you need additional space to list DVBE solicitations, please use a separate page and attach to this form.

IF THE DVBE.....	THEN.....	AND.....
was selected to participate	Check "YES" in the "SELECTED" column	include a copy of their DVBE letter(s) from OSDS
was NOT selected to participate	Check "NO" in the "SELECTED" column	state why in the "REASON NOT SELECTED" column
did not respond to your solicitation	Check the "NO RESPONSE" column.	
DVBE CONTACTED	SELECTED	REASON NOT SELECTED
	YES NO	

A copy of this form must be retained by you and may be subject to a future audit.

CERTIFICATION

I, _____, certify that I am the bidder's _____ and that I have made a diligent effort to ascertain the facts with regard to the representations made herein. In making this certification, I am aware of section 12650 et seq. of the Government Code providing for the imposition of treble damages for making false claims.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

DRUG-FREE WORKPLACE CERTIFICATION

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This Drug-Free Workplace Certification form is required from the successful Bidder pursuant to Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990. The Drug-Free Workplace Act of 1990 requires that every person or organization awarded a contract or grant for the procurement of any property or service from any state agency must certify that it will provide a drug-free workplace by doing certain specified acts. In addition, the Act provides that each contract or grant awarded by a state agency may be subject to suspension of payments or termination of the contract or grant, and the contractor or grantee may be subject to debarment from future contracting, if the contracting agency determines that specified acts have occurred.

The District is not a "state agency" as defined in the applicable section(s) of the Government Code, but the District is a local agency and public school district under California law and requires all contractors on District projects to comply with the provisions and requirements of Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990.

Contractor shall certify that it will provide a drug-free workplace by doing all of the following:

- a. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's or organization's workplace and specifying actions which will be taken against employees for violations of the prohibition.
- b. Establishing a drug-free awareness program to inform employees about all of the following:
 - (1) The dangers of drug abuse in the workplace.
 - (2) The person's or organization's policy of maintaining a drug-free workplace.
 - (3) The availability of drug counseling, rehabilitation, and employee-assistance programs.
 - (4) The penalties that may be imposed upon employees for drug abuse violations.
- c. Requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required above, and that, as a condition of employment on the contract or grant, the employee agrees to abide by the terms of the statement.

I, the undersigned, agree to fulfill the terms and requirements of Government Code section 8355 listed above and will publish a statement notifying employees concerning (a) the prohibition of controlled substance at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the Contract be given a copy of the statement required by section 8355(a), and requiring that the employee agree to abide by the terms of that statement.

I also understand that if the District determines that I have either (a) made a false certification herein, or (b) violated this certification by failing to carry out the requirements of section 8355, that the Contract awarded herein is subject to termination, suspension of payments, or both. I further

understand that, should I violate the terms of the Drug-Free Workplace Act of 1990, I may be subject to debarment in accordance with the requirements of the aforementioned Act.

I acknowledge that I am aware of the provisions of Government Code section 8350 et seq. and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

TOBACCO-FREE ENVIRONMENT CERTIFICATION

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools
("District") and _____ ("Contractor" or
"Bidder") ("Contract" or "Project").

This Tobacco-Free Environment Certification form is required from the successful Bidder.

Pursuant to, without limitation, 20 U.S.C section 6083, Labor Code section 6400 et seq., Health & Safety Code section 104350 et seq. and District Board Policies, all District sites, including the Project site, are tobacco-free environments. Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school owned vehicles and vehicles owned by others while on District property.

I acknowledge that I am aware of the District's policy regarding tobacco-free environments at District sites, including the Project site and hereby certify that I will adhere to the requirements of that policy and not permit any of my firm's employees, agents, subcontractors, or my firm's subcontractors' employees or agents to use tobacco and/or smoke on the Project site.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

HAZARDOUS MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools
("District") and _____ ("Contractor" or
"Bidder") ("Contract" or "Project").

1. Contractor hereby certifies that no Asbestos, or Asbestos-Containing Materials, polychlorinated biphenyl (PCB), or any material listed by the federal or state Environmental Protection Agency or federal or state health agencies as a hazardous material, or any other material defined as being hazardous under federal or state laws, rules, or regulations ("New Hazardous Material"), shall be furnished, installed, or incorporated in any way into the Project or in any tools, devices, clothing, or equipment used to affect any portion of Contractor's work on the Project for District.
2. Contractor further certifies that it has instructed its employees with respect to the above-mentioned standards, hazards, risks, and liabilities.
3. Asbestos and/or asbestos-containing material shall be defined as all items containing but not limited to chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite. Any or all material containing greater than one-tenth of one percent (0.1%) asbestos shall be defined as asbestos-containing material.
4. Any disputes involving the question of whether or not material is New Hazardous Material shall be settled by electron microscopy or other appropriate and recognized testing procedure, at the District's determination. The costs of any such tests shall be paid by Contractor if the material is found to be New Hazardous Material.
5. All Work or materials found to be New Hazardous Material or Work or material installed with equipment containing "New Hazardous Material" will be immediately rejected and this Work will be removed at Contractor's expense at no additional cost to the District.
6. Contractor has read and understood the document Hazardous Materials Procedures & Requirements, and shall comply with all the provisions outlined therein.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

LEAD-BASED MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This certification provides notice to the Contractor that:

- (1) Contractor's work may disturb lead-containing building materials.
- (2) Contractor shall notify the District if any work may result in the disturbance of lead-containing building materials.
- (3) Contractor shall comply with the Renovation, Repair and Painting Rule, if lead-based paint is disturbed in a six-square-foot or greater area indoors or a 20-square-foot or greater area outdoors.

1. Lead as a Health Hazard

Lead poisoning is recognized as a serious environmental health hazard facing children today. Even at low levels of exposure, much lower than previously believed, lead can impair the development of a child's central nervous system, causing learning disabilities, and leading to serious behavioral problems. Lead enters the environment as tiny lead particles and lead dust disbursts when paint chips, chalks, peels, wears away over time, or is otherwise disturbed. Ingestion of lead dust is the most common pathway of childhood poisoning; lead dust gets on a child's hands and toys and then into a child's mouth through common hand-to-mouth activity. Exposures may result from construction or remodeling activities that disturb lead paint, from ordinary wear and tear of windows and doors, or from friction on other surfaces.

Ordinary construction and renovation or repainting activities carried out without lead-safe work practices can disturb lead-based paint and create significant hazards. Improper removal practices, such as dry scraping, sanding, or water blasting painted surfaces, are likely to generate high volumes of lead dust.

Because the Contractor and its employees will be providing services for the District, and because the Contractor's work may disturb lead-containing building materials, CONTRACTOR IS HEREBY NOTIFIED of the potential presence of lead-containing materials located within certain buildings utilized by the District. All school buildings built prior to 1978 are presumed to contain some lead-based paint until sampling proves otherwise.

2. Overview of California Law

Education Code section 32240 et seq. is known as the Lead-Safe Schools Protection Act. Under this act, the Department of Health Services is to conduct a sample survey of schools in the State of California for the purpose of developing risk factors to predict lead contamination in public schools. (Ed. Code, § 32241.)

Any school that undertakes any action to abate existing risk factors for lead is required to utilize trained and state-certified contractors, inspectors, and workers. (Ed. Code, § 32243, subd. (b).) Moreover, lead-based paint, lead plumbing, and solders, or other potential sources of lead contamination, shall not be utilized in the construction of any new school facility or the modernization or renovation of any existing school facility. (Ed. Code, § 32244.)

Both the Federal Occupational Safety and Health Administration ("Fed/OSHA") and the California Division of Occupational Safety and Health ("Cal/OSHA") have implemented safety

orders applicable to all construction work where a contractor's employee may be occupationally exposed to lead.

The OSHA Regulations apply to all construction work where a contractor's employee may be occupationally exposed to lead. The OSHA Regulations contain specific and detailed requirements imposed on contractors subject to that regulation. The OSHA Regulations define construction work as work for construction, alteration, and/or repair, including painting and decorating. It includes, but is not limited to, the following:

- a. Demolition or salvage of structures where lead or materials containing lead are present;
- b. Removal or encapsulation of materials containing lead;
- c. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- d. Installation of products containing lead;
- e. Lead contamination/emergency cleanup;
- f. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- g. Maintenance operations associated with the construction activities described in the subsection.

Because it is assumed by the District that all painted surfaces (interior as well as exterior) within the District contain some level of lead, it is imperative that the Contractor, its workers and subcontractors fully and adequately comply with all applicable laws, rules and regulations governing lead-based materials (including title 8, California Code of Regulations, section 1532.1).

Contractor shall notify the District if any Work may result in the disturbance of lead-containing building materials. Any and all Work that may result in the disturbance of lead-containing building materials shall be coordinated through the District. A signed copy of this Certification shall be on file prior to beginning Work on the Project, along with all current insurance certificates.

3. Renovation, Repair and Painting Rule, Section 402(c)(3) of the Toxic Substances Control Act

The EPA requires lead safe work practices to reduce exposure to lead hazards created by renovation, repair and painting activities that disturb lead-based paint. Pursuant to the Renovation, Repair and Painting Rule (RRP), renovations in homes, childcare facilities, and schools built prior to 1978 must be conducted by certified renovations firms, using renovators with training by a EPA-accredited training provider, and fully and adequately complying with all applicable laws, rules and regulations governing lead-based materials, including those rules and regulations appearing within title 40 of the Code of Federal Regulations as part 745 (40 CFR 745).

The RRP requirements apply to all contractors who disturb lead-based paint in a six-square-foot or greater area indoors or a 20-square-foot or greater area outdoors. If a DPH-certified inspector or risk assessor determines that a home constructed before 1978 is lead-free, the federal certification is not required for anyone working on that particular building.

4. Contractor's Liability

If the Contractor fails to comply with any applicable laws, rules, or regulations, and that failure results in a site or worker contamination, the Contractor will be held solely responsible for all costs involved in any required corrective actions, and shall defend, indemnify, and hold harmless the District, pursuant to the indemnification provisions of the Contract, for all damages and other claims arising therefrom.

If lead disturbance is anticipated in the Work, only persons with appropriate accreditation, registrations, licenses, and training shall conduct this Work.

It shall be the responsibility of the Contractor to properly dispose of any and all waste products, including, but not limited to, paint chips, any collected residue, or any other visual material that may occur from the prepping of any painted surface. It will be the responsibility of the Contractor to provide the proper disposal of any hazardous waste by a certified hazardous waste hauler. This company shall be registered with the Department of Transportation (DOT) and shall be able to issue a current manifest number upon transporting any hazardous material from any school site within the District.

The Contractor shall provide the District with any sample results prior to beginning Work, during the Work, and after the completion of the Work. The District may request to examine, prior to the commencement of the Work, the lead training records of each employee of the Contractor.

THE CONTRACTOR HEREBY ACKNOWLEDGES, UNDER PENALTY OF PERJURY, THAT IT:

1. HAS RECEIVED NOTIFICATION OF POTENTIAL LEAD-BASED MATERIALS ON THE OWNER'S PROPERTY;
2. IS KNOWLEDGEABLE REGARDING AND WILL COMPLY WITH ALL APPLICABLE LAWS, RULES, AND REGULATIONS GOVERNING WORK WITH, AND DISPOSAL, OF LEAD.

THE UNDERSIGNED WARRANTS THAT HE/SHE HAS THE AUTHORITY TO SIGN ON BEHALF OF AND BIND THE CONTRACTOR. THE DISTRICT MAY REQUIRE PROOF OF SUCH AUTHORITY.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

IMPORTED MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This form shall be executed by all entities that, in any way, provide or deliver and/or supply any soils, aggregate, or related materials ("Fill") to the Project Site and shall be provided to the District at least ten (10) days before delivery. All Fill shall satisfy all requirements of any environmental review of the Project performed pursuant to the statutes and guidelines of the California Environmental Quality Act, section 21000 et seq. of the Public Resources Code ("CEQA"), and all requirements of section 17210 et seq. of the Education Code, including requirements for a Phase I environmental assessment acceptable to the State of California Department of Education and Department of Toxic Substances Control.

Certification of: ☐ Delivery Firm/Transporter ☐ Supplier ☐ Manufacturer
☐ Wholesaler ☐ Broker ☐ Retailer
☐ Distributor ☐ Other _____

Type of Entity ☐ Corporation ☐ General Partnership
☐ Limited Partnership ☐ Limited Liability Company
☐ Sole Proprietorship ☐ Other _____

Name of firm ("Firm"): _____

Mailing address: _____

Addresses of branch office used for this Project: _____

If subsidiary, name and address of parent company: _____

By my signature below, I hereby certify that I am aware of section 25260 of the Health and Safety Code and the sections referenced therein regarding the definition of hazardous material. I further certify on behalf of the Firm that all soils, aggregates, or related materials provided, delivered, and/or supplied or that will be provided, delivered, and/or supplied by this Firm to the Project Site are free of any and all hazardous material as defined in section 25260 of the Health and Safety Code. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: _____

Proper Name of Firm: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

CRIMINAL BACKGROUND INVESTIGATION /FINGERPRINTING CERTIFICATION

PROJECT/CONTRACT NO.: _____ between the San Rafael City Schools ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

The undersigned does hereby certify to the governing board of the District as follows:

That I am a representative of the Contractor currently under contract with the District; that I am familiar with the facts herein certified; and that I am authorized and qualified to execute this certificate on behalf of Contractor.

Contractor certifies that it has taken at least one of the following actions with respect to the construction Project that is the subject of the Contract (check all that apply):

- ☐ The Contractor is a sole proprietor and intends to comply with the fingerprinting requirements of Education Code section 45125.1(k) with respect to all Contractor's employees who may have contact with District pupils in the course of providing services pursuant to the Contract, and hereby agrees to the District's preparation and submission of fingerprints such that the California Department of Justice may determine that none of those employees has been convicted of a felony, as that term is defined in Education Code section 45122.1. No work shall commence until such determination by DOJ has been made.

As an authorized District official, I am familiar with the facts herein certified, and am authorized to execute this certificate on behalf of the District and undertake to prepare and submit Contractor's fingerprints as if he or she was an employee of the District.

Date: _____

District Representative's Name and Title: _____

District Representative's Signature: _____

- ☐ The Contractor, who is not a sole proprietor, has complied with the fingerprinting requirements of Education Code section 45125.1 with respect to all Contractor's employees and all of its Subcontractors' employees who may have contact with District pupils in the course of providing services pursuant to the Contract, and the California Department of Justice has determined that none of those employees has been convicted of a felony, as that term is defined in Education Code section 45122.1. A complete and accurate list of Contractor's employees and of all of its subcontractors' employees who may come in contact with District pupils during the course and scope of the Contract is attached hereto; and/or
- ☐ Pursuant to Education Code section 45125.2, Contractor has installed or will install, prior to commencement of Work, a physical barrier at the Work Site, that will limit contact between Contractor's employees and District pupils at all times; and/or
- ☐ Pursuant to Education Code section 45125.2, Contractor certifies that all employees will be under the continual supervision of, and monitored by, an employee of the Contractor who the California Department of Justice has ascertained, or as described below, will ascertain, has not been convicted of a violent or serious felony. The name and title of the employee who will be supervising Contractor's and its subcontractors' employees is:

Name: _____

Title: _____

NOTE: If the Contractor is a sole proprietor, and elects the above option, Contractor must have the above-named employee's fingerprints prepared and submitted by the District, in accordance with Education Code section 45125.1(k). No work shall commence until such determination by DOJ has been made.

As an authorized District official, I am familiar with the facts herein certified, and am authorized to execute this certificate on behalf of the District and undertake to prepare and submit Contractor's fingerprints as if he or she was an employee of the District.

Date: _____

District Representative's Name and Title: _____

District Representative's Signature: _____

- ☐ *The Work on the Contract is either (i) at an unoccupied school site and no employee and/or subcontractor or supplier of any tier of the Contract shall come in contact with the District pupils or (ii) Contractor's employees or any subcontractor or supplier of any tier of the Contract will have only limited contact, if any, with District pupils and the District will take appropriate steps to protect the safety of any pupils that may come in contact with Consultant's employees, subcontractors or suppliers so that the fingerprinting and criminal background investigation requirements of Education Code section 45125.1 shall not apply to Contractor under the Contract.*

As an authorized District official, I am familiar with the facts herein certified, and am authorized to execute this certificate on behalf of the District.

Date: _____

District Representative's Name and Title: _____

District Representative's Signature: _____

Contractor's responsibility for background clearance extends to all of its employees, Subcontractors, and employees of Subcontractors coming into contact with District pupils regardless of whether they are designated as employees or acting as independent contractors of the Contractor.

Date: _____
Proper Name of Contractor: _____
Signature: _____
Print Name: _____
Title: _____

END OF DOCUMENT

08/27/18

BUY AMERICAN CERTIFICATION

PROJECT/CONTRACT NO.: _____ between the San Rafael City Schools ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

Federal regulations require that all of the iron, steel, and manufactured goods used in projects for the construction, installation, repairs, renovation, modernization, or maintenance of a public building or public work funded in part or in whole by federal stimulus funds, with the exception of projects funded by Qualified School Construction Bonds, be produced in the United States of America, unless a federal department waives this requirement because (1) it is inconsistent with the public interest, (2) the goods are not produced in sufficient quantities or of satisfactory quality in the United States, or (3) the requirement would increase the cost of the Project overall by more than twenty-five percent (25%) ("Buy American").

Contractor shall submit this Certification with its executed agreement, identifying the steps Contractor will take to use goods produced in the United States of America in carrying out this Contract. Bidder should not submit this form with its bid.

Contractor shall retain a copy of this form and may be subject to a future audit.

CERTIFICATION

On behalf of Contractor, I represent and covenant that Contractor will use on the Project only iron, steel and manufactured goods produced in the United States of America except goods for which a federal department has waived this requirement.

I, _____, certify that I am the Contractor's _____ and that the representations and covenants made herein are true and correct. In making this certification, I am aware of section 12650 et seq. of the Government Code providing for the imposition of treble damages for making false claims.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

Date: _____

Proper Name of Firm: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

**PREVAILING WAGE AND
RELATED LABOR REQUIREMENTS CERTIFICATION**

PROJECT/CONTRACT NO.: _____ between San Rafael City Schools
("District") and _____ ("Contractor" or
"Bidder") ("Contract" or "Project").

I hereby certify that I will conform to the State of California Public Works Contract requirements regarding prevailing wages, benefits, on-site audits with 48-hours notice, payroll records, and apprentice and trainee employment requirements, for all Work on the above Project including, without limitation, labor compliance monitoring and enforcement by the Department of Industrial Relations.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

REGISTERED SUBCONTRACTORS LIST
(Labor Code Section 1771.1)[A1]

PROJECT: Terra Linda High School – Student Commons

Date Submitted (for Updates): _____

Contractor acknowledges and agrees that it must clearly set forth below the name and Department of Industrial Relations (DIR) registration number of each subcontractor **for all tiers** who will perform work or labor or render service to Contractor or its subcontractors in or about the construction of the Work **at least two (2) weeks before the subcontractor is scheduled to perform work.** This document is to be updated as all tiers of subcontractors are identified.

Contractor acknowledges and agrees that, if Contractor fails to list as to any subcontractor of any tier who performs any portion of Work, the Contract is subject to cancellation and the Contractor will be subjected to penalty under applicable law.

If further space is required for the list of proposed subcontractors, attach additional copies of page 2 showing the required information, as indicated below.

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

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Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Date: _____

Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

POST BID INTERVIEW

PART 1 – GENERAL

1.01 SUMMARY

If requested by the District, this Section requires the apparent low bidder to attend and participate in a Post Bid Interview with the Construction Manager, prior to award of any contract by the District. The Post Bid Interview will be scheduled by the Construction Manager within three (3) calendar days after the date of bid.

1.02 REQUIRED ATTENDANCE

- A. A duly authorized representative of the apparent low bidder is required to attend the Post Bid Interview, in person.
- B. The apparent low bidder's authorized representative(s) must have (1) knowledge of how the bid submitted was prepared, (2) the person responsible for supervising performance of the Work, and (3) the authority to bind the apparent low bidder.
- C. Failure to attend the Post Bid Interview as scheduled will be considered just cause for the District to reject the Bid as nonresponsive.

1.03 POST BID INTERVIEW PROCEDURE

- A. The Construction Manager will review the Bid with the attendees.
- B. The Construction Manager will review the Contract Documents with the attendees, including but not limited to:
 - (1) Insurance
 - (2) Bonding
 - (3) Addenda
 - (4) Pre-Bid Clarifications
 - (5) Scope of Work
 - (6) Bid Packages Descriptions
 - (7) Bid Alternates
 - (8) Contract Plans
 - (9) Contract Specifications
 - (10) Project Schedule and Schedule Requirements
 - (11) Critical Dates Requirement for Other Bid Packages
 - (12) Prevailing Wage Requirements
 - (13) Liquidated Damages

(14) Required Documentation for Contract Administration

(15) Contract Coordination Requirements

1.04 POST BID INTERVIEW DOCUMENTATION

The Construction Manager will document the Post Bid Interview on the form attached to this Section. Both the apparent low bidder and the Construction Manager are required to sign the Post Bid Interview Documentation.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

POST BID INTERVIEW

CONSTRUCTION MANAGER

[Name]

[Address 1]

[Address 2]

[Phone]

[Fax]

BIDDER: _____

DATE: _____ TIME: _____ PHONE: _____

I. INTRODUCTIONS:

A. Present

CONTRACTOR

CONTRACTOR

[CM]

[CM]

II. PROPOSED CONTRACT:

III. PURPOSE OF INTERVIEW IS TO ASSURE A MUTUAL UNDERSTANDING OF THE FOLLOWING:

- | | | |
|--|-----|----|
| A. Do you acknowledge submission of a complete and accurate bid? | Yes | No |
| B. Do you acknowledge the Bid Document submittal timelines after NOA and NTP and can you meet those timelines? | Yes | No |
| C. Do you acknowledge the requirements for the escrow of bid documents? | Yes | No |
| D. Are you comfortable with your listed subcontractors? | Yes | No |

IV. CONTRACTUAL REQUIREMENTS:

- | | | |
|--|-----|----|
| A. Do you understand you are a prime contractor? | Yes | No |
| B. Can you meet specified insurance requirements? | Yes | No |
| 1. Do any of your policies that require Additional Insured endorsements exceed the minimum coverage requirements? | Yes | No |
| 2. Are you requesting that the District accept an Excess Liability Insurance Policy to meet the policy limit? | Yes | No |
| 3. Will there be a gap between the per occurrence amount of any underlying policy and the start of the coverage under the Umbrella or Excess Liability Insurance Policy? | Yes | No |
| C. Will you provide the Performance Bond and Labor and Material Bond for 100% of the Contract Price as stipulated? | Yes | No |
| 1. Cost for bonds: _____ % | Yes | No |

2.	Is the cost of your bonds in your base bid?	Yes	No
3.	Is your surety licensed to issue bonds in California?	Yes	No
D.	Do you understand the fingerprinting requirements?	Yes	No
E.	Is it understood that all workers must be paid prevailing wage?	Yes	No
F.	Is it understood that all subcontractors of every tier must be registered as a public works contractor with the Department of Industrial Relations?	Yes	No
V. SCOPE OF WORK:			
A.	Acknowledged Receipt of Addenda #1-__	Yes	No
B.	Are the costs for addenda items included in your bid? (if applicable)	Yes	No
C.	Do you have a complete understanding of your Scope of Work under the proposed Agreement?	Yes	No
D.	You have re-reviewed the documents and understand the Scope of the Work. Are there any items that require clarification?	Yes	No
If yes, please identify them.			
1.	_____		

2.	_____		

3.	_____		

	Is (are) there additional cost(s) for the above item(s)?	Yes	No
E.	Is the cost for allowance included in your bid?	Yes	No
F.	Have you reviewed bid alternative(s) #1-__? (if applicable)	Yes	No
G.	Are the costs for bid alternatives included in your bid?	Yes	No
H.	Are the plans and specifications clear and understandable to your satisfaction?	Yes	No
I.	Do you acknowledge that the time to submit notice of requests for substitution of specified materials has expired?	Yes	No
VI. SCHEDULE:			
A.	Do you acknowledge and agree to the stipulated completion dates and milestones in the contract?	Yes	No
1.	Will you provide a detailed construction schedule to _____ within the required ten (10) days of the Notice to Proceed, per the contract?	Yes	No

- | | | | |
|----|--|-------|----|
| 2. | Can you meet the submittal deadline? | Yes | No |
| | | | |
| 3. | It is understood that the Project schedule is critical and that that weekend and overtime work may be required to meet the milestones. | Yes | No |
| | | | |
| 4. | It is understood that if rain does occur, then all dewatering and protection of work is required, per the contract. If not, what do you believe must change and why? | Yes | No |
| | | <hr/> | |
| | | <hr/> | |
| | | <hr/> | |

- | | | | |
|----|---|-----|----|
| B. | Identify critical materials, deliveries, long lead items and other dependencies, including Owner Furnished items that could affect the completion of your work. | Yes | No |
| | | | |
| 1. | <hr/> | | |
| 2. | <hr/> | | |
| 3. | <hr/> | | |
| 4. | <hr/> | | |
| 5. | <hr/> | | |

- | | | | |
|----|---|-----|----|
| C. | Do you understand that there is going to be maintenance and other construction taking place on site during the course of the project? | Yes | No |
|----|---|-----|----|

VII. EXECUTION OF WORK

- | | | | |
|----|---|-----|----|
| A. | Do you understand the access to the site? | Yes | No |
| | | | |
| B. | Do you understand the staging area restrictions? | Yes | No |
| | | | |
| C. | Have you included protection of [asphalt, floors, and roofs]? | Yes | No |
| | | | |
| D. | Do you understand that the site is occupied by students, teachers, administrators, parents, etc.? | Yes | No |

VIII. CONTRACTOR COMMENTS/SUGGESTIONS:

- | | |
|----|-------|
| 1. | <hr/> |
| 2. | <hr/> |
| 3. | <hr/> |
| 4. | <hr/> |
| 5. | <hr/> |

IX. CONTRACTOR

You agree the information contained herein is part of your contractual obligations. Your signature acknowledges your agreement to perform all Work in the Contract Documents, and that costs for all Work are included in your bid.

The foregoing information is true and accurate, and I am authorized to sign as an officer of the company I am representing.

[Company Name]

Signature _____ Title: _____

Date: _____

X. CONSTRUCTION MANAGER

Signature _____ Title: _____

Date: _____

Title of Document: POST BID INTERVIEW
Number of Pages: _____
Date of Document: _____

END OF DOCUMENT

04/01/19

DOCUMENT 00 51 00

NOTICE OF AWARD

Dated: _____ 20__

To: _____ (Contractor)

To: _____
(Address)

From: Governing Board ("Board") of the San Rafael City Schools ("District" or "Owner")

PROJECT: Terra Linda High School – Student Commons, Project No. _____ ("Project").

Contractor has been awarded the referenced Contract on _____, 20__, by action of the superintendent or superintendent's designee pursuant to a delegation of authority by the District's Board pending ratification..

The Contract Price is _____ Dollars (\$_____), and includes Alternates _____.

Three (3) copies of each of the Contract Documents (except Drawings) accompany this Notice of Award. Three (3) sets of the Drawings will be delivered separately or otherwise made available. Additional copies are available at cost of reproduction.

You must comply with the following conditions precedent within SEVEN (7) calendar days of the date of this Notice of Award.

The Contractor shall execute and submit the following documents by 5:00 p.m. of the SEVENTH (7th) calendar day following the date of the Notice of Award.

- a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.
- b. Escrow of Bid Documentation: This must include all required documentation. See the document titled Escrow Bid Documentation for more information.
- c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
- d. Payment Bond (Contractor's Labor & Material Bond) (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
- e. Insurance Certificates and Endorsements as required.
- f. Workers' Compensation Certification.
- g. Prevailing Wage and Related Labor Requirements Certification.
- h. Disabled Veteran Business Enterprise Participation Certification.
- i. Drug-Free Workplace Certification.
- j. Tobacco-Free Environment Certification.
- k. Hazardous Materials Certification.

- l. Lead-Based Materials Certification.
- m. Imported Materials Certification.
- n. Criminal Background Investigation/Fingerprinting Certification.
- o. Buy American Certification.
- p. Roofing Project Certification: from Contractor, Material Manufacturer and/or Vendor.
- q. Registered Subcontractors List: Must include Department of Industrial Relations (DIR) registration number of each subcontractor for all tiers.

Failure to comply with these conditions within the time specified will entitle District to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited, as well as any other rights the District may have against the Contractor.

After you comply with those conditions, District will return to you one fully signed counterpart of the Agreement.

SAN RAFAEL CITY SCHOOLS

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

04/02/19

AGREEMENT

THIS AGREEMENT IS MADE AND ENTERED INTO THIS _____ DAY OF _____, 20____, by and between the San Rafael City Schools ("District") and BHM Construction ("Contractor") ("Agreement").

WITNESSETH: That the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree with each other, as follows:

1. **The Work:** Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, and material necessary to perform and complete in a good and workmanlike manner, the work of the following project:

Terra Linda High School – New Commons, Kitchen, Library, Music, Drama Classroom Project

("Project" or "Contract" or "Work")

It is understood and agreed that the Work shall be performed and completed as required in the Contract Documents including, without limitation, the Drawings and Specifications and submission of all documents required to secure funding or by the Division of the State Architect for close-out of the Project, under the direction and supervision of, and subject to the approval of, the District or its authorized representative.

2. **The Contract Documents:** The complete Contract consists of all Contract Documents as defined in the General Conditions and incorporated herein by this reference. Any and all obligations of the District and Contractor are fully set forth and described in the Contract Documents. All Contract Documents are intended to cooperate so that any Work called for in one and not mentioned in the other or vice versa is to be executed the same as if mentioned in all Contract Documents.
3. **Interpretation of Contract Documents:** Should any question arise concerning the intent or meaning of Contract Documents, including the Drawings or Specifications, the question shall be submitted to the District for interpretation. If a conflict exists in the Contract Documents, valid, written modifications, beginning with the most recent, shall control over this Agreement (if any), which shall control over the Special Conditions, which shall control over any Supplemental Conditions, which shall control over the General Conditions, which shall control over the remaining Division 0 documents, which shall control over Division 1 Documents which shall control over Division 2 through Division 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In no case shall a document calling for lower quality and/or quantity material or workmanship control. The decision of the District in the matter shall be final.
4. **Time for Completion:** It is hereby understood and agreed that the Work under this Contract shall be completed within dates set forth in the Lease-Lease-Back Agreement.
5. **Completion - Extension of Time:** Should the Contractor fail to complete this Contract, and the Work provided herein, within the time fixed for completion, due allowance being made for the contingencies provided for herein, the Contractor shall become liable to the District for all loss and damage that the District may suffer on account thereof. The Contractor shall coordinate its Work with the Work of all other contractors. The District shall not be liable for delays resulting from Contractor's failure to coordinate its Work with other contractors in a manner that will allow timely completion of Contractor's Work. Contractor shall be liable for delays to other contractors caused by Contractor's failure to coordinate its Work with the Work of other contractors.

6. **Liquidated Damages:** Time is of the essence for all work under this Agreement. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that the District will sustain in the event of and by reason of Contractor's delay; therefore, Contractor agrees that it shall pay to the District the sum of Five Thousand dollars (\$5,000.00) per day as liquidated damages for each and every day's delay beyond the time herein prescribed in finishing the Work.

It is hereby understood and agreed that this amount is not a penalty.

In the event that any portion of the liquidated damages is not paid to the District, the District may deduct that amount from any money due or that may become due the Contractor under this Agreement, and such deduction does not constitute a withholding or penalty. The District's right to assess liquidated damages is as indicated herein and in the General Conditions.

The time during which the Contract is delayed for cause, as hereinafter specified, may extend the time of completion for a reasonable time as the District may grant, provided that Contractor has complied with the claims procedure of the Contract Documents. This provision does not exclude the recovery of damages by either party under other provisions in the Contract Documents.

7. **Loss Or Damage:** The District and its agents and authorized representatives shall not in any way or manner be answerable or suffer loss, damage, expense, or liability for any loss or damage that may happen to the Work, or any part thereof, or in or about the same during its construction and before acceptance, and the Contractor shall assume all liabilities of every kind or nature arising from the Work, either by accident, negligence, theft, vandalism, or any cause whatsoever; and shall hold the District and its agents and authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatsoever.
8. **Insurance and Bonds:** Prior to issuance of the Notice to Proceed by the District, Contractor shall provide all required certificates of insurance, insurance endorsements, and payment and performance bonds as evidence thereof.
9. **Prosecution of Work:** If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this Contract, the District, may, pursuant to the General Conditions and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.
10. **Authority of Architect, Project Inspector, and DSA:** Contractor hereby acknowledges that the Architect(s), the Project Inspector(s), and the Division of the State Architect ("DSA") have authority to approve and/or suspend Work if the Contractor's Work does not comply with the requirements of the Contract Documents, Title 24 of the California Code of Regulations, and all applicable laws and regulations. The Contractor shall be liable for any delay caused by its non-compliant Work.
11. **Assignment of Contract:** Neither the Contract, nor any part thereof, nor any moneys due or to become due thereunder, may be assigned by the Contractor without the prior written approval of the District, nor without the written consent of the Surety on the Contractor's Performance Bond (the "Surety"), unless the Surety has waived in writing its right to notice of assignment.
12. **Classification of Contractor's License:** Contractor hereby acknowledges that it currently holds valid Type B Contractor's license(s) issued by the State of California, Contractors' State License Board, in accordance with division 3, chapter 9, of the Business and Professions Code and in the classification called for in the Contract Documents. Subcontractors shall hold valid licenses as required per CSLB.

13. **Registration as Public Works Contractor:** The Contractor and all Subcontractors currently are registered as public works contractors with the Department of Industrial Relations, State of California, in accordance with Labor Code section 1771.1.
14. **Payment of Prevailing Wages:** The Contractor and all Subcontractors shall pay all workers on all Work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code.
15. This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and Title 8 of the California Code of Regulations. Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code, including, without limitation, the requirement that the Contractor and all of its Subcontractors shall timely submit complete and accurate electronic certified payroll records as required by the Contract Documents, or the District may not issue payment.
16. **Contract Price:** In consideration of the foregoing covenants, promises, and agreements on the part of the Contractor, and the strict and literal fulfillment of each and every covenant, promise, and agreement, and as compensation agreed upon for the Work and construction, erection, and completion as aforesaid, the District covenants, promises, and agrees that it will well and truly pay and cause to be paid to the Contractor in full, and as the full Contract Price and compensation for construction, erection, and completion of the Work hereinabove agreed to be performed by the Contractor, the following price:

_____ Dollars
(\$ _____),

- in lawful money of the United States, which sum is to be paid according to the schedule provided by the Contractor and accepted by the District and subject to additions and deductions as provided in the Contract. This amount supersedes any previously stated and/or agreed to amount(s).
17. **No Representations:** No representations have been made other than as set forth in writing in the Contract Documents, including this Agreement. Each of the Parties to this Agreement warrants that it has carefully read and understood the terms and conditions of this Agreement and all Contract Documents, and that it has not relied upon the representations or advice of any other Party or any attorney not its own.
18. **Entire Agreement:** The Contract Documents, including this Agreement, set forth the entire agreement between the parties hereto and fully supersede any and all prior agreements, understandings, written or oral, between the parties hereto pertaining to the subject matter thereof.
19. **Severability:** If any term, covenant, condition, or provision in any of the Contract Documents is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the provisions in the Contract Documents shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby.

IN WITNESS WHEREOF, accepted and agreed on the date indicated above:

CONTRACTOR

SAN RAFAEL CITY SCHOOLS

By: _____

By: .

Title: _____

Title: _____

NOTE: If the party executing this Contract is a corporation, a certified copy of the by-laws, or of the resolution of the Board of Directors, authorizing the officers of said corporation to execute the Contract and the bonds required thereby must be attached hereto.

END OF DOCUMENT

04/02/19

FACILITIES LEASE

For a portion of the following Site:

Terra Linda High School New Commons, Kitchen, Library, Drama, Music and Classroom
Building Project
320 Nova Albion Way
San Rafael, CA 94903
APN: 175-060-31

By and between

San Rafael City Schools
310 Nova Albion Way
San Rafael, CA 94903

And

BHM Construction, Inc.
221 Gateway Road W. Ste. 405
Napa, CA 94558

Dated as of November 14, 2018

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FACILITIES LEASE

This facilities lease ("Facilities Lease"), dated as of November 14, 2018 ("Effective Date"), is made and entered into by and between BHM Construction, Inc. ("Developer"), a [California corporation] duly organized and existing under the laws of the State of California, as sublessor, and San Rafael City Schools, a school district duly organized and validly existing under the laws of the State of California, as sublessee ("District") (together, the "Parties").

RECITALS

WHEREAS, the District is authorized under Section 17406 of the Education Code of the State of California to lease a site to a developer and to have that developer develop and construct the project on the site and to lease back to the District the site and the completed project; and

WHEREAS, the District desires to provide for the development and construction of certain work to be performed on portions of the School Site which will include construction of improvements to be known as the New Commons, Kitchen, Library, Music, Drama Building Project ("Project"); and

WHEREAS, on the date hereof, the District has leased to Developer, a parcel of land located at 320 Nova Albion Way, San Rafael, CA 94903, known as Terra Linda High School, particularly described in **Exhibit A** and shown on **Exhibit B** attached hereto and incorporated herein by reference ("School Site"); and

WHEREAS, District and Developer have executed a site lease at the same time as this Facilities Lease whereby the District is leasing the Project Site to the Developer ("Site Lease"); and

WHEREAS, District has retained HED Architects ("Architect") to prepare plans and specifications for the Project ("Plans and Specifications") and to act as the Design Professional in General Responsible Charge for the Project; and

WHEREAS, the Governing Board of the District ("Board") has determined that it is in the best interests of the District and for the common benefit of the citizens residing in the District to construct the Project by leasing the Project Site to Developer and by simultaneously entering into this Facilities Lease under which the District will lease back the Project Site and the Project from Developer and if necessary, make Lease Payments; and

WHEREAS, the District further acknowledges and agrees that it has entered into the Site Lease and the Facilities Lease pursuant to Education Code Section 17406 as the best available and most expeditious means for the District to satisfy its substantial need for the facilities to be provided by the Project and to accommodate and educate District students and to utilize its facilities proceeds expeditiously; and

WHEREAS, this Site Lease and Facilities Lease are awarded based a competitive solicitation process pursuant to Education Code section 17406 and in compliance with the required procedures and guidelines for evaluating the qualifications of proposers adopted and published by the Board to the proposer providing the best value to the school district, taking into consideration the proposer's demonstrated competence and professional qualifications necessary for the satisfactory performance of the services required; and

WHEREAS, the selection of the Developer was conducted in a fair and impartial manner; and

WHEREAS, Developer has reviewed the Lease Documents; and

WHEREAS, Developer represents that it has the expertise and experience to perform the services set forth in this Facilities Lease; and

WHEREAS, the Parties have performed all acts, conditions and things required by law to exist, to have happened and to have been performed precedent to and in connection with the execution and entering into of this Facilities Lease and all those conditions precedent do exist, have happened and have been performed in regular and due time, form and manner as required by law, and the Parties hereto are now duly authorized to execute and enter into this Facilities Lease; and

WHEREAS, Developer is authorized to lease the Project Site as lessee and to develop the Project and to have the Project constructed on the Project Site and to lease the Project and the Project Site back to the District and has duly authorized the execution and delivery of this Facilities Lease.

NOW, THEREFORE, in consideration of the above recitals and of the mutual covenants hereinafter contained, the Parties hereto do hereby agree as follows:

1. Definitions

In addition to the terms and entities defined above or in subsequent provisions, and unless the context otherwise requires, the terms defined in this section shall, for all purposes of this Facilities Lease, have the meanings herein specified.

- 1.1** "Developer" or "Lessor" means [Developer], a [California corporation], organized and existing under the laws of the State of California, and its successors and assigns.
- 1.2** "Developer's Representative" means the Managing Member of Developer, or any person authorized to act on behalf of Developer under or with respect to this Facilities Lease.
- 1.3** "Contract Documents" are defined in **Exhibit "D"** to this Facilities Lease.
- 1.4** "District" or "Lessee" means San Rafael City Schools, a school district duly organized and existing under the laws of the State of California.

- 1.5 "District Representative"** means the Superintendent of the District, or any other person authorized by the Board of Education of the District to act on behalf of the District under or with respect to this Facilities Lease.
- 1.6 "Permitted Encumbrances"** means, as of any particular time:
- 1.6.1** Liens for general ad valorem taxes and assessments, if any, not then delinquent, or which the District may permit to remain unpaid;
 - 1.6.2** The Site Lease.
 - 1.6.3** This Facilities Lease.
 - 1.6.4** Easements, rights of way, mineral rights, drilling rights and other rights, reservations, covenants, conditions or restrictions which exist of record as of the date of this Facilities Lease.
 - 1.6.5** Easements, rights of way, mineral rights, drilling rights and other rights, reservations, covenants, conditions or restrictions established following the date of recordation of this Facilities Lease and to which Developer and the District consent in writing which will not impair or impede the operation of the Project Site.

2. Exhibits

The following Exhibits are attached to and by reference incorporated and made a part of this Facilities Lease:

- 2.1 Exhibit A - Legal Description of the School Site:** The descriptions of the real property constituting the School Site.
- 2.2 Exhibit B - Description of the Project Site:** The map or diagram depiction of the Project Site.
- 2.3 Exhibit C - Guaranteed Maximum Price and Other Project Cost, Funding, and Payment Provisions:** A detailed description of the Guaranteed Maximum Price and the provisions related to the payment of that amount to the Developer, including Attachment 3, the Schedule of Lease Payments and Payoff Dates and Amounts.
- 2.4 Exhibit D - General Construction Provisions:** The provisions generally describing the Project's construction.
- 2.5 Exhibit D-1 - Special Conditions Provisions:** The provisions describing conditions specific to the Project's construction.
- 2.6 Exhibit E - Memorandum of Commencement Date:** The Memorandum which will memorialize the commencement and expiration dates of the Lease Term.
- 2.7 Exhibit F - Construction Schedule**

2.8 Exhibit G – Schedule of Values

3. Lease of Project and Project Site

- 3.1** Developer hereby leases the Project and the Project Site to the District, and the District hereby leases said Project and Project Site from Developer upon the terms and conditions set forth in this Facilities Lease.
- 3.2** The leasing by Developer to the District of the Project Site shall not affect or result in a merger of the District's leasehold estate pursuant to this Facilities Lease and its fee estate as lessor under the Site Lease. Developer shall continue to have and hold a leasehold estate in the Project Site pursuant to the Site Lease throughout the term thereof and the term of this Facilities Lease.
- 3.3** As to the Project Site, this Facilities Lease shall be deemed and constitute a sublease.

4. Term

4.1 Facilities Lease is Legally Binding

This Facilities Lease is legally binding on the Parties upon execution by the Parties and the District Board's approval of this Facilities Lease. The Term of this Facilities Lease for the purposes of District's obligation to make Lease Payments shall commence on the earlier of the following two (2) events, whichever occurs first ("Commencement Date"):

- 4.1.1** The date the District takes beneficial occupancy of the Project; or
- 4.1.2** The date when Developer delivers possession of the Project to District and when all improvements to be provided by Developer are determined by the District to be completed as set forth in **Exhibits D and D-1** to this Facilities Lease.

Unless earlier terminated pursuant to the provisions of the Contract Documents, the Term of this Facilities Lease for the purposes of District's obligations to make Lease Payments shall terminate one (1) year thereafter or upon payment of the final lease payment.

- 4.2** After Developer has completed construction of the Project and the District has accepted the Project, the Parties shall execute the Memorandum of Commencement Date attached hereto as **Exhibit E** to memorialize the commencement date of the Lease Payments and expiration date of the Term. Notwithstanding this Term, the Parties hereby acknowledge that each has obligations, duties, and rights under this Facilities Lease that exist upon execution of this Facilities Lease and prior to the beginning of the Lease Payment obligations.
- 4.3** The Term may be extended or shortened upon the occurrence of the earliest of any of the following events, which shall constitute the end of the Term:

- 4.3.1** An Event of Default by District as defined herein and Developer's election to terminate this Facilities Lease as permitted herein, or
- 4.3.2** An Event of Default by Developer as defined herein and District's election to terminate this Facilities Lease as permitted herein, or
- 4.3.3** Consummation of the District's purchase option pursuant to the Guaranteed Maximum Price and Other Project Cost, Funding, and Payment Provisions indicated in **Exhibit C** ("Guaranteed Maximum Price Provisions").
- 4.3.4** A third-party taking of the Project under Eminent Domain, only if the Term is ended as indicated more specifically herein.
- 4.3.5** Damage or destruction of the Project, only if the Term is ended as indicated more specifically herein.

5. Payment

In consideration for the lease of the Project Site by the Developer back to the District and for other good and valuable consideration, the District shall make all necessary payments pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C**.

6. Title

- 6.1** During the Term of this Facilities Lease, the District shall hold fee title to the School Site, including the Project Site, and nothing in this Facilities Lease or the Site Lease shall change, in any way, the District's ownership interest.
- 6.2** During the Term of this Facilities Lease, Developer shall have a leasehold interest in the Project Site pursuant to the Site Lease.
- 6.3** During the Term of this Facilities Lease, the Developer shall hold title to the Project improvements provided by Developer which comprise fixtures, repairs, replacements or modifications thereto.
- 6.4** If the District exercises its Purchase Option pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C** or if District makes all necessary payments under the Guaranteed Maximum Price Provisions indicated in **Exhibit C**, all right, title and interest of Developer, its assigns and successors in interest in and to the Project and the Project Site shall be transferred to and vested in the District at the end of the Term. Title shall be transferred to and vested in the District hereunder without the necessity for any further instrument of transfer; provided, however, that Developer agrees to execute any instrument requested by District to memorialize the termination of this Facilities Lease and transfer of title to the Project.

7. Quiet Enjoyment

Upon District's possession of the Project, Developer shall thereafter provide the District with quiet use and enjoyment of the Project, and the District shall during the Term peaceably and quietly have and hold and enjoy the Project, without suit, trouble or hindrance from Developer, except as otherwise may be set forth in this Facilities Lease. Developer will, at

the request of the District and at Developer's cost, join in any legal action in which the District asserts its right to such possession and enjoyment to the extent Developer may lawfully do so. Notwithstanding the foregoing, Developer shall have the right to inspect the Project and the Project Site as provided herein.

8. Representations of the District

The District represents, covenants and warrants to the Developer as follows:

8.1 Due Organization and Existence

The District is a school district, duly organized and existing under the Constitution and laws of the State of California.

8.2 Authorization

The District has the full power and authority to enter into, to execute and to deliver this Facilities Lease, and to perform all of its duties and obligations hereunder and has duly authorized the execution of this Facilities Lease.

8.3 No Violations

Neither the execution and delivery of this Facilities Lease nor the Site Lease, nor the fulfillment of or compliance with the terms and conditions hereof or thereof, nor the consummation of the transactions contemplated hereby or thereby, conflicts with or results in a breach of the terms, conditions or provisions of any restriction or any agreement or instrument to which the District is now a party or by which the District is bound, or constitutes a default under any of the foregoing, or results in the creation or imposition of any lien, charge or encumbrance whatsoever upon any of the property or assets of the District, or upon the Project Site, except Permitted Encumbrances.

8.4 Condemnation Proceedings

8.4.1 District covenants and agrees, but only to the extent that it may lawfully do so, that so long as this Facilities Lease remains in effect, the District will not seek to exercise the power of eminent domain with respect to the Project so as to cause a full or partial termination of this Facilities Lease.

8.4.2 If for any reason the foregoing covenant is determined to be unenforceable or in some way invalid, or if District should fail or refuse to abide by such covenant, then, to the extent it may lawfully do so, District agrees that the financial interest of Developer shall be as indicated in this Facilities Lease.

9. Representations of the Developer

The Developer represents, covenants and warrants to the District as follows:

9.1 Due Organization and Existence

The Developer is a California company duly organized and existing under the laws of the State of California, has the power to enter into this Facilities Lease and the Site Lease; is possessed of full power to lease, lease back, and hold real and personal property and has duly authorized the execution and delivery of all of the aforesaid agreements.

9.2 Authorization

Developer has the full power and authority to enter into, to execute and to deliver this Facilities Lease, and to perform all of its duties and obligations hereunder and has duly authorized the execution of this Facilities Lease.

9.3 No Violations

Neither the execution and delivery of this Facilities Lease and the Site Lease, nor the fulfillment of or compliance with the terms and conditions hereof or thereof, nor the consummation of the transactions contemplated hereby or thereby, conflicts with or results in a breach of the terms, conditions or provisions of any restriction or any agreement or instrument to which Developer is now a party or by which Developer is bound, or constitutes a default under any of the foregoing, or results in the creation or imposition of any lien, charge or encumbrance whatsoever upon any of the property or assets of Developer, or upon the Project Site, except Permitted Encumbrances.

9.4 No Bankruptcy

Developer is not now, nor has it ever been in bankruptcy or receivership.

9.5 No Encumbrances

Developer shall not pledge any District payments of any kind, related to the Site Lease, this Facilities Lease, or in any way derived from the Project Site, and shall not mortgage or encumber the Project Site, except as may be specifically permitted pursuant to the provisions of this Facilities Lease related to Developer's financing the construction of the project.

9.6 Continued Existence

Developer shall not voluntarily commence any act intended to dissolve or terminate the legal existence of Developer, at or before the latest of the following:

9.6.1 Eighteen (18) months following completion of the Project.

9.6.2 One (1) year following expiration or earlier termination of the Term.

9.6.3 After dismissal and final resolution of any and all disputes between the Parties and/or any third-party claims related, in any way, to the Project.

While the lease documents are in effect, Developer shall give District one hundred twenty (120) days written notice prior to dissolving or terminating the legal existence of Developer.

10. Pre-construction Services

10.1 Scope of the Preconstruction Services

Developer shall perform management and coordination services, plan and specification constructability reviews, provide value-engineering reviews and recommendations and other reviews as necessary to verify that the drawings and specifications are clear and reasonably accurate to minimize the need for changes during the construction phase of the project, including but not limited to the following:

10.1.1 General Services

- 10.1.1.1** Developer shall attend regular meetings during Project development between the Architect, the District, District site personnel, and any other applicable consultants of the District as required to discuss the Project, including budget, scope and schedule.
- 10.1.1.2** Review the Project with the District and Architect and refine Project scope with District staff and Architect. Sequence and schedule construction work for the Project with Architect, construction manager(s), program manager, and District staff
- 10.1.1.3** Developer shall assist the Architect with making formal presentations to the governing board of District. Such assistance is anticipated to include floor plans and elevations necessary for any architectural presentation.
- 10.1.1.4** Developer shall prepare a rough schedule in Microsoft PROJECT and update as necessary.
- 10.1.1.5** Developer shall prepare and update the components of the Guaranteed Maximum Price and shall be primarily responsible for ensuring that the Project can and is constructed for no more than that amount.
- 10.1.1.6** While the Architect is anticipated to provide primary assistance, Developer shall assist District with City land use issues;
- 10.1.1.7** Architect shall act as lead and Developer will assist District and Architect with DSA review, input, and timeframe for same;

10.1.1.8 Architect shall act as lead and Developer will assist with review and comment upon geotechnical / soils investigation and report;

10.1.1.9 Architect shall act as lead and Developer will assist with review and comment upon survey of the Project site;

10.1.2 Review of Design Documents.

10.1.2.1 Review Project design and budget with the District and the Architect based on the Design Development Documents, 50% Construction Documents, and the 100% Construction Documents submitted to DSA to:

10.1.2.1.1 Provide recommendations for incorporating prefabrication (component and/or modular) construction into Project, within context of Project functional requirements, budget, and schedule.

10.1.2.1.2 Provide recommendations on site use and improvements, selection of materials, building systems and equipment and methods of Project delivery;

10.1.2.1.3 Provide recommendations on relative feasibility of construction methods, availability of materials and labor, time requirements for procurement, installation and construction of the Project and subparts thereof if requested, and factors relating to cost including, but not limited to, construction costs of alternate designs of materials, preliminary budgets and possible economics that could be achieved through alternate methods or substitutions;

10.1.2.1.4 Provide interim design phase estimates to establish and maintain the Project budget and scheduled costs; and

10.1.2.1.5 Provide plan review.

10.1.2.1.6 Value-engineering. Prepare a value-engineering report for District review and approval that:

10.1.2.1.6.1 Details areas of cost saving (e.g. construction processes/procedures, specified materials and equipment, and equipment or other aspects of the design documents that can be modified to reduce costs and/or the time for achieving final completion of the Project and/or to extend life-cycle and/or to reduce maintenance/operations costs, without diminution in the quality of

materials/equipment/workmanship, scope or intended purposes of the Project);

10.1.2.1.6.2 Provides detailed estimate for proposed value-engineering items;

10.1.2.1.6.3 Defines methodology or approaches that maximize value; and

10.1.2.1.6.4 Identifies design choices that can be more economically delivered.

10.1.2.1.7 Constructability Review. Prepare detailed interdisciplinary constructability review within Fourteen (14) days of receipt of the plans from the District that:

10.1.2.1.7.1 Ensures construction documents are well coordinated and reviewed for errors;

10.1.2.1.7.2 Identifies to the extent known, construction deficiencies and areas of concern;

10.1.2.1.7.3 Back-checks design drawings for inclusion of modifications;

10.1.2.1.7.4 Provides the District with written confirmation that:

10.1.2.1.7.4.1 Requirements noted in the design documents prepared for the Project are consistent with and conform to the District's Project requirements and design standards.

10.1.2.1.7.4.2 Various components have been coordinated and are consistent with each other so as to minimize conflicts within or between components of the design documents.

10.1.2.2 Confirm Modifications to Design Drawings. If the District accepts Developer's comments, including the value-engineering and/or constructability review comments, review the design documents to confirm that those comments are properly incorporated into the final design documents.

10.1.3 Budget of Project Costs.

10.1.3.1 At each stage of plan review indicated above, Developer will update and refine the budget of the Guaranteed Maximum

Price based on the most recent set of design documents. Developer shall also advise the District and the Architect if it appears that the total construction costs may exceed the Guaranteed Maximum Price established by the District and shall make recommendations for corrective action. Developer will further provide input to the District and Architect relative to value of construction, means and methods for construction, duration of construction of various building methods and constructability.

10.1.3.2 In each budget of the Guaranteed Maximum Price, Developer shall include values of scopes of work subdivided into component parts in sufficient detail to serve as the basis for progress payments during construction. This budget of the Guaranteed Maximum Price shall include, at a minimum, the following information divided into at least the following categories for each site:

10.1.3.2.1 Overhead and profit;

10.1.3.2.2 Supervision;

10.1.3.2.3 General conditions;

10.1.3.2.4 Layout & Mobilization (not more than 1%)

10.1.3.2.5 Submittals, samples, shop drawings (not more than 3%);

10.1.3.2.6 Bonds and insurance (not more than 2%);

10.1.3.2.7 Close-out documentation (not less than 3%);

10.1.3.2.8 Demolition;

10.1.3.2.9 Installation;

10.1.3.2.10 Rough-in;

10.1.3.2.11 Finishes;

10.1.3.2.12 Testing;

10.1.3.2.13 Owner and Maintenance Manuals;

10.1.3.2.14 Punchlist and acceptance.

10.1.4 Construction Schedule and Phasing Plan

Developer shall prepare a preconstruction schedule to guide the design team through to bid dates. That schedule shall show the multiple phases and interrelations of design, constructability review, and estimating. Developer shall also prepare a full

construction schedule for the Project detailing the phasing and construction activities. Developer shall further investigate, recommend and prepare a schedule for the District's purchase of materials and equipment requiring long lead time procurement, and coordinate the schedule with the early preparation of portions of the Contract Documents by the Architect.

10.1.5 Construction Planning and Bidding

- 10.1.5.1** For all of Developer's activities relating to construction planning and bidding, Developer shall comply with all applicable legal requirements, including but not limited to those set forth in Education Code section 17406.
- 10.1.5.2** Consult with District staff in relation to the existing site. Selected developer should make site visits, as needed to review the current site conditions. During this evaluation, Developer may make recommendations relating to soils investigations and utility locations and capacities, in order to minimize unforeseen conditions.
- 10.1.5.3** Attend meetings at the Project site with the Architect and the design team every two (2) weeks, until plans are ready for submittal to DSA (approximately 6 to 8 weeks, meeting duration is approximately 2 hours).
- 10.1.5.4** Provide plan review and constructability services with an emphasis on ensuring that the Project can be completed within the established schedule and within the available budget.
- 10.1.5.5** Provide a detailed analysis of all major Project systems with an emphasis on possible value engineering possibilities.
- 10.1.5.6** Prepare and distribute specifications and drawings provided by District to facilitate bidding to Developer's subcontractors.
- 10.1.5.7** Review the drawings and specifications to eliminate areas of conflict and overlapping in the work to be performed by various subcontractors, and with a view to eliminating change order requests by the Architect or subcontractors.
- 10.1.5.8** Conduct pre-bid conferences. Coordinate with District and the Architect in responding to subcontractor questions or providing clarification to all subcontractors.
- 10.1.5.9** DSA approved plans shall be utilized to receive subcontractor bids and develop the final GMP in accordance with the lease-leaseback agreement forms, including the requirement that the Developer engage in competitive bidding for subcontractors for all scopes of work on the Project that constitute more than one half of one percent

(0.5%) of the total GMP. The District representative shall be present during the receipt of bids from subcontractors.

10.1.5.10 The GMP shall be presented to the District in the following manner within a three ring binder as well as electronically on an external memory device such as a CD, USB drive, or other comparable device:

10.1.5.10.1 Cover sheet, signed by the developer indicating the GMP dollar amount with a certification, indicating that the GMP is all inclusive per the plans, specifications and addenda (contract documents). Also include certification stating, "Developer hereby certifies that they have reviewed all subcontractor proposals and whether the subcontractor excluded portions of their scope the Developer has included all costs for a complete GMP in accordance with plans, specifications and addenda."

10.1.5.10.2 A bid tabulation sheet indicating the breakdown by subcontractor/trade along with the appropriate general condition amount, other fees (as submitted with the response to the RFQ/P).

10.1.5.10.3 Behind the bid tabulation sheet mentioned above should be a sheet that indicates what is included in the general conditions, which should match what was submitted in the response to the RFQ/P.

10.1.5.10.4 Copies of all subcontractor bids received divided by trade that corresponds to the final spread sheet with a cover sheet indicating the scope and subcontractors that provided bids as well as those that were asked to bid, but did not submit a proposal. This sheet should have the dollar amounts for each subcontractor that provided a bid with the first column being the proposed subcontractor for that trade.

10.1.5.10.5 Behind subdivision 10.1.5.10.4 above should be the bids for that trade with the proposed subcontractor bid on top and the other subcontractor bids in descending dollar order.

10.1.5.11 Produce detailed construction CPM schedules to be incorporated into the Project documents including identification of the Project critical path and agency approvals.

10.1.5.12 Plan the phases and staging of construction, staging areas, temporary fencing, office trailer placement, access, etc. as required.

10.1.5.13 Any other services that are reasonable and necessary to control the budget and schedule. List those areas where subconsultants will be required and where the Developer has in-house expertise. Provide resumes of persons providing each of these services and for key personnel assigned to the Project.

10.2 Schedule

Preconstruction services outlined above will commence on the date the District issues a notice to proceed for the Agreement, and conclude upon approval of the Amendment to the Lease Agreements by District's Board on or about February, 2019 or termination of this Agreement by either party per the Agreement's terms. It is anticipated that construction will commence on or about March, 2019. Any extension shall be subject to reasonable approval in writing by the parties.

10.3 Ownership of Records

It is mutually agreed that all materials prepared by Developer under this Agreement shall become the property of the District and Developer shall have no property right therein whatsoever. Developer hereby assigns to District any copyrights associated with the materials prepared pursuant to the Agreement.

10.4 Open Book Policy

There will be an open book policy with Developer and its construction team. District shall have access to all subcontractor bids, value engineering back-up, contingency breakdown & tracking, and Developer fees.

10.5 Compensation to Developer for Preconstruction Services

District agrees to reimburse Developer in the total amount not to exceed Ten Thousand Dollars (\$10,000), for the performance of services contemplated by this Agreement. Developer shall be paid monthly for the actual fees and allowed costs and expenses for all time and materials required and expended for work requested and specified by the District as completed. Said amount shall be paid within thirty (30) days upon submittal to and verification by the District of a monthly billing statement showing completion of the tasks for that month on a line item basis. In the event Developer and District enter into the lease/leaseback agreements for the development of the Project, this compensation for services rendered will be included as part of the Guaranteed Maximum Price ("GMP") to be paid to Developer by District.

Developer shall be responsible for any and all costs and expenses incurred by Developer, including but not limited to the costs of hiring sub-consultants, contractors and other professionals, review of the Project's Plans and Specifications, review and preparation of necessary documentation relating to the development of the Project, all travel-related expenses, as well as for meetings with District and its representatives, long distance telephone charges, copying expenses, salaries of Developer staff and employees working on the Project, overhead, and any other reasonable expenses

incurred by Developer in performance of the services contemplated by this Agreement.

10.6 Termination before Construction Phase

10.6.1 Before the notice to proceed with the Construction Phase is issued by the District, this Agreement may be terminated at any time without cause by District upon fourteen (14) days written notice to Developer. In the event of such a termination by District, the District shall pay Developer for all undisputed services performed and expenses incurred per this Agreement, supported by documentary evidence, including, but not limited to, payroll records, invoices from third parties retained by Developer pursuant to this Agreement, and expense reports up until the date of notice of termination plus any sums due Developer for Board-approved extra services. In ascertaining the services actually rendered hereunder up to the date of termination of this Agreement, consideration shall be given to completed work and work in process that would best serve the District if a completed product was presented.

10.6.2 In the event that the parties do not reach an agreement on the GMP, this Agreement will be terminated at that time. In the event of such a termination, the District shall pay Developer no more than the not to exceed amount in Section 10.5 above.

10.7 Construction Phase

Developer shall not commence any construction work before DSA approval of the Plans and Specifications.

11. Construction of Project

11.1 Construction of Project

11.1.1 Developer agrees to cause the Project to be developed, constructed, and installed in accordance with the terms hereof and the Construction Provisions set forth in **Exhibit D**, including those things reasonably inferred from the Contract Documents as being within the scope of the Project and necessary to produce the stated result even though no mention is made in the Contract Documents.

11.1.2 Contract Time / Construction Schedule

It is hereby understood and agreed that the Contract Time for this Project shall be 18 months (360) calendar days, commencing with the date upon which the Facilities Lease and the Site Lease are fully executed and delivered to both Parties and ending with completion of the Work which will occur no later than _____, 20__ ("Contract Time"). The Construction Schedule must be approved by the District.

11.1.3 Schedule of Values

The Developer has provided a schedule of values, approved by the District, which will be attached hereto as **Exhibit G** ("Schedule of Values"). The Schedule of Values must be approved by the District.

11.1.4 Liquidated Damages

Time is of the essence for all work Developer must perform to complete the Project. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that the District will sustain in the event of and by reason of Developer's delay; therefore, Developer agrees that it shall pay to the District the sum of two thousand Dollars (\$2,000) per day as liquidated damages for each and every day's delay beyond the Contract Time.

11.1.4.1 It is hereby understood and agreed that this amount is not a penalty.

11.1.4.2 In the event any portion of the liquidated damages is not paid to the District, the District may deduct that amount from any money due or that may become due the Developer under this Facilities Lease. The District's right to assess liquidated damages is as indicated herein and in **Exhibit D**.

11.1.4.3 The time during which the construction of the Project is delayed for cause as hereinafter specified may extend the time of completion for a reasonable time as the District may grant.

11.1.5 Guaranteed Maximum Price

Developer will cause the Project to be constructed within the Guaranteed Maximum Price as set forth and defined in the Guaranteed Maximum Price Provisions in **Exhibit C**, and Developer will not seek additional compensation from District in excess of that amount.

11.1.6 Modifications

If the DSA requires changes to the Contract Documents submitted by District to Developer, and those changes change the construction costs and/or construction time for the Project, then those changed costs or time will be handled as a modification pursuant to the provisions of **Exhibit D**.

12. Maintenance

Following delivery of possession of the Project by Developer to District, the repair, improvement, replacement and maintenance of the Project and the Project Site shall be at

the sole cost and expense and the sole responsibility of the District, subject only to all punch list items and warranties against defects in materials and workmanship of Developer as provided in **Exhibit D**. The District shall pay for or otherwise arrange for the payment of the cost of the repair and replacement of the Project resulting from ordinary wear and tear. The District waives the benefits of subsections 1 and 2 of Section 1932 of the California Civil Code, but such waiver shall not limit any of the rights of the District under the terms of this Facilities Lease.

13. Utilities

Following delivery of possession of the Project by Developer to District, the cost and expenses for all utility services, including, but not limited to, electricity, natural gas, telephone, water, sewer, trash removal, cable television, janitorial service, security, heating, water, internet service, data transmission, and all other utilities of any type shall be paid by District.

14. Taxes and Other Impositions

All ad valorem real property taxes, special taxes, possessory interest taxes, bonds and special lien assessments or other impositions of any kind with respect to the Project, the Project Site and the improvements thereon, charged to or imposed upon either Developer or the District or their respective interests or estates in the Project, shall at all times be paid by District. In the event any possessory interest tax is levied on Developer, its successors and assigns, by virtue of this Facilities Lease or the Site Lease, District shall pay such possessory interest tax directly, if possible, or shall reimburse Developer, its successors and assigns for the full amount thereof within forty-five (45) days after presentation of proof of payment by Developer.

15. Insurance

15.1 Developer's Insurance

The Developer shall comply with the insurance requirements as indicated here and in **Exhibit D** and **Exhibit D-1**.

15.1.1 Commercial General Liability and Automobile Liability Insurance

15.1.1.1 Developer shall procure and maintain, during the life of the Project, Commercial General Liability Insurance and Automobile Liability Insurance that shall protect Developer, District, its Board Members, employees, agents, Construction Manager(s), Project Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, personal injury, death, advertising injury, and medical payments arising from operations under the Project. This coverage shall be provided in a form at least as broad as Insurance Services (ISO) Form CG 00 01 11 88. Developer shall ensure that Products Liability and Completed Operations coverage, Fire Damage Liability, and Any auto including owned, non-owned, and hired, are included within the

above policies and at the required limits, or Developer shall procure and maintain these coverages separately.

15.1.1.2 Developer's deductible or self-insured retention for its Commercial General Liability Insurance policy shall not exceed five thousand dollars (\$5,000) for deductible or twenty-five thousand dollars (\$25,000) for self-insured retention, respectively, unless approved in writing by District.

15.1.1.3 All such policies shall be written on an occurrence form.

15.1.2 Excess Liability Insurance

15.1.2.1 Developer may procure and maintain, during the life of the Project, an Excess Liability Insurance Policy to meet the policy limit requirements of the required policies if Developer's underlying policy limits are less than required.

15.1.2.2 There shall be no gap between the per occurrence amount of any underlying policy and the start of the coverage under the Excess Liability Insurance Policy. Any Excess Liability Insurance Policy shall protect Developer, District, its Board Members, employees, agents, Construction Manager(s), Project Manager(s), Project Inspector(s), and Architect(s) in amounts and including the provisions as set forth in **Exhibit D** or **Exhibit D-1** and/or the Supplementary Conditions (if any), and that complies with all requirements for Commercial General Liability and Automobile Liability and Employers' Liability Insurance.

15.1.2.3 The District, in its sole discretion, may accept the Excess Liability Insurance Policy that bring Contractor's primary limits to the minimum requirements herein.

15.1.3 Subcontractor

Developer shall require its Subcontractor(s), if any, to procure and maintain Commercial General Liability Insurance, Automobile Liability Insurance, and Excess Liability Insurance (if Subcontractor elects to satisfy, in part, the insurance required herein by procuring and maintaining an Excess Liability Insurance Policy) with minimum limits at least equal to the amount required of the Developer except where smaller minimum limits are permitted as set forth below.

15.1.4 Workers' Compensation and Employers' Liability Insurance

15.1.4.1 In accordance with provisions of section 3700 of the California Labor Code, the Developer and every

Subcontractor shall be required to secure the payment of compensation to its employees.

15.1.4.2 Developer shall procure and maintain, during the life of the Project, Workers' Compensation Insurance and Employers' Liability Insurance for all of its employees engaged in work under the Project, on/or at the Site of the Project. This coverage shall cover, at a minimum, medical and surgical treatment, disability benefits, rehabilitation therapy, and survivors' death benefits. Developer shall require its Subcontractor(s), if any, to procure and maintain Workers' Compensation Insurance and Employers' Liability Insurance for all employees of Subcontractor(s). Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by Developer's insurance. If any class of employee or employees engaged in Work on the Project, on or at the Site of the Project, is not protected under the Workers' Compensation Insurance, Developer shall provide, or shall cause a Subcontractor to provide, adequate insurance coverage for the protection of any employee(s) not otherwise protected before any of those employee(s) commence work.

15.1.5 Builder's Risk Insurance: Builder's Risk "All Risk" Insurance

15.1.5.1 Developer shall procure and maintain, during the life of this Contract, Builder's Risk (Course of Construction), or similar first party property coverage acceptable to the District, issued on a replacement cost value basis. The cost shall be consistent with the total replacement cost of all insurable Work of the Project included within the Contract Documents. Coverage is to insure against all risks of accidental physical loss and shall include without limitation the perils of vandalism and/or malicious mischief (both without any limitation regarding vacancy or occupancy), sprinkler leakage, civil authority, theft, sonic disturbance, earthquake, flood, collapse, wind, rain, dust, fire, war, terrorism, lightning, smoke, and rioting. Coverage shall include debris removal, demolition, increased costs due to enforcement of all applicable ordinances and/or laws in the repair and replacement of damaged and undamaged portions of the property, and reasonable costs for the Architect's and engineering services and expenses required as a result of any insured loss upon the Work and Project, including completed Work and Work in progress, to the full insurable value thereof.

15.1.6 Pollution Liability Insurance

15.1.6.1 Developer shall procure and maintain Pollution Liability Insurance that shall protect Developer, District,

Construction Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, including natural resource damage, cleanup costs, removal, storage, disposal, and/or use of the pollutant arising from operations under this Facilities Lease, and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims. Coverage shall apply to sudden and/or gradual pollution conditions resulting from the escape or release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or gases, natural gas, waste materials, or other irritants, contaminants, or pollutants, including asbestos. This coverage shall be provided in a form at least as broad as Insurance Services Offices, Inc. (ISO) Form CG 2415, or Developer shall procure and maintain these coverages separately.

15.1.6.2 Developer shall warrant that any retroactive date applicable to coverage under the policy predates the Effective Date of this Facilities Lease and that continuous coverage will be maintained or an extended reporting or discovery period will be exercised for a period of three (3) years, beginning from the time that the Work under the Contract is completed.

15.1.6.3 If Developer is responsible for removing any pollutants from a site, then Developer shall ensure that Any Auto, including owned, non-owned, and hired, are included within the above policies and at the required limits, to cover its automobile exposure for transporting the pollutants from the site to an approved disposal site. This coverage shall include the Motor Carrier Act Endorsement, MCS 90.

15.1.7 Professional Liability Insurance

15.1.7.1 To the extent that any portion of the design professional in general responsible charge of the Project's responsibilities are delegated to Developer pursuant to DSA authorization, Developer shall procure and maintain insurance to cover Developer's prime design professional and/or structural engineer, and his/her consultant(s) on a Claims Made basis for Two million dollars (\$2,000,000) aggregate limit, One million dollars (\$1,000,000) per claim, and subject to no more than Twenty-Five Thousand dollars (\$25,000) per claim deductible, coverage to continue through completion of construction plus two (2) years thereafter.

15.1.8 Proof of Carriage of Insurance and Other Requirements Endorsements and Certificates

15.1.8.1 Developer shall not commence Work nor shall it allow any Subcontractor to commence Work on the Project,

until Developer and its Subcontractor(s) have procured all required insurance and Developer has delivered in duplicate to the District complete endorsements (or entire insurance policies) and certificates indicating the required coverages have been obtained, and the District has approved these documents.

15.1.8.2 Endorsements, certificates, and insurance policies shall include the following:

15.1.8.2.1 A clause stating:

"This policy shall not be amended, canceled or modified and the coverage amounts shall not be reduced until notice has been mailed to District, Architect, and Construction Manager stating date of amendment, modification, cancellation or reduction. Date of amendment, modification, cancellation or reduction may not be less than thirty (30) days after date of mailing notice."

15.1.8.2.2 Language stating in particular those insured, extent of insurance, location and operation to which insurance applies, expiration date, to whom cancellation and reduction notice will be sent, and length of notice period.

15.1.8.3 All endorsements, certificates and insurance policies shall state that District, its Board Members, employees and agents, Construction Manager(s), Project Manager(s), Inspector(s) and Architect(s) are named additional insureds under all policies except Workers' Compensation Insurance and Employers' Liability Insurance.

15.1.8.4 Insurance written on a "claims made" basis shall be retroactive to a date that coincides with or precedes Contractor's commencement of Work, including subsequent policies purchased as renewals or replacements. Said policy is to be renewed by the Developer and all Subcontractors for a period of five (5) years following completion of the Work or termination of this Facilities Lease. Such insurance must have the same coverage and limits as the policy that was in effect during the term of this Facilities Lease, and will cover

the Developer and all Subcontractors for all claims made.

15.1.8.5 Developer's and Subcontractors' insurance policy(s) shall be primary and non-contributory to any insurance or self-insurance maintained by District, its Board Members, employees and/or agents, the State of California, Construction Manager(s), Project Manager(s), Inspector(s), and/or Architect(s).

15.1.8.6 All endorsements shall waive any right to subrogation against any of the named additional insureds.

15.1.8.7 All policies shall be written on an occurrence form.

15.1.8.8 All of Developer's insurance shall be with insurance companies with an A.M. Best rating of no less than A: XI.

15.1.8.9 The insurance requirements set forth herein shall in no way limit the Developer's liability arising out of or relating to the performance of the Work or related activities.

15.1.8.10 Failure of Developer and/or its Subcontractor(s) to comply with the insurance requirements herein shall be deemed a material breach of the Facilities Lease and constitute a Default by the Developer pursuant to this Facilities Lease.

15.1.9 Insurance Policy Limits

The limits of insurance shall not be less than the following amounts:

Commercial General Liability	Combined Single Limit	\$4,000,000
	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	\$4,000,000
Automobile Liability – Any Auto	Combined Single Limit	\$4,000,000
Workers Compensation		Statutory limits pursuant to State law
Employers' Liability		\$4,000,000
Pollution Liability		\$1,000,000 per claim; \$2,000,000 aggregate
Professional Liability		\$1,000,000 per claim; \$2,000,000 aggregate (with aggregate

		subject to no more than a \$25,000 per claim deductible)
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The limits of insurance for those subcontractors whose scope of work does not exceed ten percent (10%) of the Guaranteed Maximum Cost shall not be less than the following amounts:

Commercial General Liability	Combined Single Limit	\$2,000,000
	Product Liability and Completed Operations	\$2,000,000
Automobile Liability - Any Auto	Combined Single Limit	\$2,000,000
Workers Compensation		Statutory limits pursuant to State law
Employers' Liability		\$2,000,000

Notwithstanding anything in this Facilities Lease to the contrary, the above insurance requirements may be modified as appropriate for subcontractors, with District's prior written approval.

15.2 District's Insurance

15.2.1 Rental Interruption Insurance

District shall at all times from and after District's acceptance of the Project, for the benefit of District and Developer, as their interests may appear, maintain rental interruption insurance to cover loss, total or partial, of the use of the Project due to damage or destruction, in an amount at least equal to the maximum estimated Lease Payments payable under this Facilities Lease during the current or any future twenty-four (24) month period. This insurance may be maintained as part of or in conjunction with any other insurance coverage carried by the District, and such insurance may be maintained in whole or in part in the form of participation by the District in a joint powers agency or other program providing pooled insurance. This insurance may not be maintained in the form of self-insurance. The proceeds of this insurance shall be paid to the Developer.

15.2.2 Property Insurance

District shall at all times from and after District's acceptance of the Project, carry and maintain in force a policy of property insurance for 100% of the insurable replacement value with no coinsurance penalty, on the Project Site and the Project, together with all improvements thereon, under a standard "all risk" contract insuring against loss or damage. Developer shall be named as additional

insureds or co-insureds thereon by way of endorsement. District shall not be relieved from the obligation of supplying any additional funds for replacement of the Project and the improvements thereon in the event of destruction or damage where insurance does not cover replacement costs. District shall have the right to procure the required insurance through a joint powers agency or to self-insure against such losses or portion thereof as is deemed prudent by District.

16. Indemnification and Defense

- 16.1** To the fullest extent permitted by California law, Developer shall indemnify, keep and hold harmless the District and its respective Board Members, officers, representatives, employees, consultants, the Architect and Construction Manager in both individual and official capacities and their consultants ("Indemnitees"), against all suits, claims, damages, losses, and expenses, including but not limited to attorney's fees and costs, caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by the Developer or its Subcontractors, vendors and/or suppliers, including any suit, claim, damage, loss, or expense attributable to, without limitation, bodily injury, sickness, disease, death, alleged patent violation or copyright infringement, or injury to or destruction of tangible property (including damage to the Work itself) and including the loss of use resulting therefrom, except to the extent caused wholly by the active negligence or willful misconduct of the Indemnitees. This indemnification and hold harmless obligation includes any failure or alleged failure by Developer to comply with any law and/or provision of the Contract Documents, including, without limitation, any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the California Department of Industrial Relations.
- 16.2** Developer shall also defend, at its own expense, Indemnitees with legal counsel reasonably acceptable to the District, against all suits, claims, allegations, damages, losses, and expenses, including but not limited to attorneys' fees and costs, caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by Developer, its Subcontractors, vendors, or suppliers, except to the extent caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees. This defense obligation extends to any failure or alleged failure by Developer to comply with any provision of law, any failure or alleged failure to timely and properly fulfill all of its obligations under the Contract Documents in strict accordance with their terms, and without limitation, any failure or alleged failure of Developer's obligations regarding any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the California Department of Industrial Relations. This agreement and obligation of the Developer shall not be construed to negate, abridge, or otherwise reduce any right or obligation of defense that would otherwise exist as to any party or person described herein.
- 16.3** The Developer shall give prompt notice to the District in the event of any injury (including death), loss, or damage included herein. Without limitation of the provisions herein, if the Developer's agreement to indemnify and hold harmless the Indemnitees or its agreement to defend Indemnitees as

provided herein against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the negligence of any of the Indemnitees shall to any extent be or be determined to be void or unenforceable, it is the intention of the parties that these circumstances shall not otherwise affect the validity or enforceability of the Developer's agreement to indemnify, defend, and hold harmless the rest of the Indemnitees, as provided herein, and in the case of any such suits, claims, damages, losses, or expenses caused in part by the default, negligence, or act or omission of the Developer, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, and in part by any of the Indemnitees, the Developer shall be and remain fully liable on its agreements and obligations herein to the fullest extent permitted by law.

16.4 In any and all claims against any of the Indemnitees by any employee of the Developer, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the Developer's indemnification obligation herein shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Developer or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

16.5 The District may retain so much of the moneys due to the Developer as shall be considered necessary, until disposition of any such suit, claims or actions for damages or until the District, Architect and Construction Manager have received written agreement from the Developer that Developer will unconditionally defend the District and its respective Board Members, officers, representatives, employees, consultants, the Architect and Construction Manager and their sub-consultants and pay any damages due by reason of settlement or judgment.

16.6 The indemnification and defense obligations hereunder shall survive the completion of Work, including the warranty/guarantee period, and/or the termination of the Contract.

17. Eminent Domain

17.1 Total Taking After Project Delivery

If, following delivery of possession of the Project by Developer to District, all of the Project and the Project Site is taken permanently under the power of eminent domain, the Term shall cease as of the day possession shall be so taken.

17.1.1 The financial interest of Developer shall be limited to the amount of principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C that are then due or past due together with all remaining and succeeding principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C for the remainder of the original Term. For example, if all of the Project and the Project Site is taken at the end of the third year of the Term, Developer shall be entitled to receive from the eminent domain award the sum of all principal payments pursuant

to the Guaranteed Maximum Price Provisions indicated in Exhibit C that would have been owing for the fourth year through the end of the Term had there been no taking.

17.1.2 The balance of the award, if any, shall be paid to the District.

17.2 Total Taking Prior to Project Delivery

If all of the Project and the Project Site is taken permanently under the power of eminent domain and the Developer is still performing the work of the Project and has not yet delivered possession of the Project to District, the Term shall cease as of the day possession shall be so taken. The financial interest of Developer shall be the amount Developer has expended to date for work performed on the Project, subject to documentation reasonably satisfactory to the District.

17.3 Partial Taking.

If, following delivery of possession of the Project by Developer to District, less than all of the Project and the Project Site is taken permanently, or if all of the Project and the Project Site or any part thereof is taken temporarily, under the power of eminent domain.

17.3.1 This Facilities Lease shall continue in full force and effect and shall not be terminated by virtue of that partial taking and the Parties waive the benefit of any law to the contrary, and

17.3.2 There shall be a partial abatement of any principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C as a result of the application of the net proceeds of any eminent domain award to the prepayment of those payments hereunder. The Parties agree to negotiate, in good faith, for an equitable split of the net proceeds of any eminent domain award and a corresponding reduction in the payments required pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C.

18. Damage and Destruction

If, following delivery of possession of all or a portion of the Project by Developer to District, the Project is totally or partially destroyed due to fire, acts of vandalism, flood, storm, earthquake, Acts of God, or other casualty beyond the control of either party hereto, the Term shall end and District shall no longer be required to make any payments required pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C** that are then due or past due or any remaining and succeeding principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C** for the remainder of the original Term.

19. Abatement

19.1 If, after the Parties have executed the Memorandum of Commencement Date attached hereto as **Exhibit E**, the Project becomes destroyed or damaged beyond repair, the District may determine its use of the Project abated. Thereafter, the District shall have no obligation to make, nor shall the

Developer have the right to demand, the Lease Payments as indicated in the Guaranteed Maximum Price Provisions indicated in **Exhibit C** to this Facilities Lease. The Term shall cease at that time.

19.2 The Parties hereby agree that the net proceeds of the District's rental interruption insurance that the District must maintain during the Term, as required herein, shall constitute a special fund for the payment of the Lease Payments indicated in the Guaranteed Maximum Price Provisions indicated in **Exhibit C**.

19.3 The District shall as soon as practicable after such event, apply the net proceeds of its insurance policy intended to cover that loss ("Net Proceeds"), either to:

19.3.1 Repair the Project to full use.

19.3.2 Replace the Project, at the District's sole cost and expense, with property of equal or greater value to the Project immediately prior to the time of the destruction or damage, and that replacement, once completed, shall be substituted in this Facilities Lease by appropriate endorsement; or

19.3.3 Exercise the District's purchase option as indicated in the Guaranteed Maximum Price Provisions indicated in Exhibit C to this Facilities Lease.

19.4 The District shall notify the Developer of which course of action it desires to take within thirty (30) days after the occurrence of the destruction or damage. The Net Proceeds of all insurance payable with respect to the Project shall be available to the District and shall be used to discharge the District's obligations under this Section.

20. Access

20.1 By Developer

Developer shall have the right at all reasonable times to enter upon the Project Site to construct the Project pursuant to this Facilities Lease. Following the acceptance of the Project by District, Developer may enter the Project at reasonable times with advance notice and arrangement with District for purposes of making any repairs required to be made by Developer.

20.2 By District

The District shall have the right to enter upon the Project Site at all times. District shall comply with all safety precautions and procedures required by Developer.

21. Assignment, Subleasing

21.1 Assignment and Subleasing by the District

Any assignment or sublease by District shall be subject to all of the following conditions:

- 21.1.1** This Facilities Lease and the obligation of the District to make the payments required pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C shall remain obligations of the District; and
- 21.1.2** The District shall, within thirty (30) days after the delivery thereof, furnish or cause to be furnished to Developer a true and complete copy of any assignment or sublease.

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21.2 Assignment by Developer

Developer may assign its right, title and interest in this Facilities Lease, in whole or in part to one or more assignees, only after the written consent of District, which District will not unreasonably withhold. No assignment shall be effective against the District unless and until the District has consented in writing. Notwithstanding anything to the contrary contained in this Facilities Lease, no consent from the District shall be required in connection with any assignment by Developer to a lender for purposes of financing the Project as long as there are not additional costs to the District.

22. Termination, Default And Suspension

22.1 Termination; Lease Terminable Only As Set Forth Herein

22.1.1 Except as otherwise expressly provided in this Facilities Lease, this Facilities Lease shall not terminate, nor shall District have any right to terminate this Facilities Lease or be entitled to the abatement of any necessary payments pursuant to the Guaranteed Maximum Price Provisions in Exhibit C or any reduction thereof. The obligations hereunder of District shall not be otherwise affected by reason of any damage to or destruction of all or any part of the Project; the taking of the Project or any portion thereof by condemnation or otherwise; the prohibition, limitation or restriction of District's use of the Project; the interference with such use by any private person or contractor; the District's acquisition of the ownership of the Project (other than pursuant to an express provision of this Facilities Lease); any present or future law to the contrary notwithstanding. It is the intention of the Parties hereto that all necessary payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C shall continue to be payable in all events, and the obligations of the District hereunder shall continue unaffected unless the requirement to pay or perform the same shall be terminated or modified pursuant to an express provision of this Facilities Lease.

22.1.2 Nothing contained herein shall be deemed a waiver by the District of any rights that it may have to bring a separate action with respect to any Event of Default by Developer hereunder or under any other agreement to recover the costs and expenses associated with that action. The District covenants and agrees that it will remain obligated under this Facilities Lease in accordance with its terms.

22.1.3 Following completion of the Project, the District will not take any action to terminate, rescind or avoid this Facilities Lease, notwithstanding the bankruptcy, insolvency, reorganization, composition, readjustment, liquidation, dissolution, winding-up or other proceeding affecting Developer or any assignee of Developer in any such proceeding, and notwithstanding any action with respect to this Facilities Lease which may be taken by any trustee

or receiver of Developer or of any assignee of Developer in any such proceeding or by any court in any such proceeding. Following completion of the Project, except as otherwise expressly provided in this Facilities Lease, District waives all rights now or hereafter conferred by law to quit, terminate or surrender this Facilities Lease or the Project or any part thereof.

- 22.1.4** District acknowledges that Developer may assign an interest in some or all of the necessary payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C to a lender in order to obtain financing for the cost of constructing the Project and that the lender may rely on the foregoing covenants and provisions in connection with such financing.

22.2 District's Right to Terminate Developer for Cause

22.2.1 Grounds for Termination

The District, in its sole discretion, without prejudice to any other right or remedy, may terminate the Site Lease and Facilities Lease and/or terminate the Developer's right to perform the work of the Facilities Lease based upon any of the following:

- 22.2.1.1** Developer refuses or fails to execute the Work or any separable part thereof; or
- 22.2.1.2** Developer fails to complete said Work within the time specified or any extension thereof; or
- 22.2.1.3** Developer persistently fails or refused to perform Work or provide material of sufficient quality as to be in compliance with the Facilities Lease; or
- 22.2.1.4** Prior to completion of the Project, Developer is adjudged a bankrupt, files a petition for relief as a debtor, or a petition is filed against the Developer without its consent, and the petition not dismissed within sixty (60) days; or
- 22.2.1.5** Prior to the completion of the Project, Developer makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency; or
- 22.2.1.6** Developer persistently or repeatedly refuses and/or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials to complete the Work in the time specified; or
- 22.2.1.7** Developer fails to make prompt payment to Subcontractors, or for material, or for labor; or

- 22.2.1.8** Developer persistently disregards laws, or ordinances, or instructions of District as indicated in **Exhibit D**, or otherwise in violation of **Exhibit D**; or
- 22.2.1.9** Developer fails to supply labor, including that of Subcontractors, that is sufficient to prosecute the Work or that can work in harmony with all other elements of labor employed or to be employed on the Work; or
- 22.2.1.10** Developer or its Subcontractor(s) is/are otherwise in breach, default, or in substantial violation of any provision of this Facilities Lease, including but not limited to a lapse in licensing or registration.

22.2.2 Notification of Termination

- 22.2.2.1** Upon the occurrence at District's sole determination of any of the above conditions, or upon Developer's failure to perform any material covenant, condition or agreement in this Facilities Lease, District may, without prejudice to any other right or remedy, serve written notice upon Developer and its Surety of District's termination of this Facilities Lease and/or the Developer's right to perform the work of this Facilities Lease. This notice will contain the reasons for termination.
 - 22.2.2.1.1** Unless, within fifteen (15) days after the service of the notice, any and all condition(s) shall cease, and any and all violation(s) shall cease, or arrangement satisfactory to District for the correction of the condition(s) and/or violation(s) be made, this Facilities Lease and the Site Lease shall cease and terminate.
 - 22.2.2.1.2** If the failure stated in the notice cannot be corrected within fifteen (15) days after the service of notice, District may consent to an extension of time, provided Developer instituted and diligently pursued corrective action within the applicable fifteen (15)-day period and until the violation is corrected. Upon District determination, Developer shall not be entitled to receive any further payment until the entire Work is finished.
- 22.2.2.2** Upon Termination, District may immediately serve written notice of tender upon Surety whereby Surety shall have the right to take over and perform this Facilities Lease only if Surety:

22.2.2.2.1 Within three (3) days after service upon it of the notice of tender, gives District written notice of Surety's intention to take over and perform this Facilities Lease; and

22.2.2.2.2 Commences performance of this Facilities Lease within three (3) days from date of serving of its notice to District.

22.2.2.3 Surety shall not utilize Developer in completing the Project if the District notifies Surety of the District's objection to Developer's further participation in the completion of the Project. Surety expressly agrees that any developer which Surety proposes to fulfill Surety's obligations is subject to District's approval.

22.2.2.4 If Surety fails to notify District or begin performance as indicated herein, District may take over the Work and execute the Work to completion by any method it may deem advisable at the expense of Developer and/or its Surety. Developer and its Surety shall be liable to District for any excess cost or other damages the District incurs thereby. Time is of the essence in this Facilities Lease. If the District takes over the Work as herein provided, District may, without liability for so doing, take possession of and utilize in completing the Work all materials, appliances, plan, and other property belonging to Developer as may be on the Site of the Work, in bonded storage, or previously paid for.

22.2.3 Effect of Termination

22.2.3.1 If District terminates the Site Lease and the Facilities Lease pursuant to this section, the Project Site and any improvements built upon the Project Site shall vest in District upon termination of the Site Lease and Facilities Lease, and District shall thereafter be required to pay only the principal amounts then due and owing pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C, less any damages incurred by District due to Developer's default, acts, or omissions.

22.2.3.2 The District shall retain all rights it possesses pursuant to this Facilities Lease including, without limitation.

22.2.3.2.1 The right to assess liquidated damages due because of any project delay; and

22.2.3.2.2 All rights the District holds to demand performance pursuant to the Developer's required performance bond.

22.2.3.3 Developer shall, only if ordered to do so by the District, immediately remove from the Site all or any materials and personal property belonging to Developer that have not been incorporated in the construction of the Work, or which are not in place in the Work. The District retains the right, but not the obligation, to keep and use any materials and personal property belonging to Developer that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Developer and its Surety shall be liable upon the performance bond for all damages caused the District by reason of the Developer's failure to complete the Work under this Facilities Lease.

22.2.3.4 In the event that the District shall perform any portion of, or the whole of the Work, pursuant to the provisions of the General Conditions, the District shall not be liable nor account to the Developer in any way for the time within which, or the manner in which, the Work is performed by the District or for any changes the District may make in the Work or for the money expended by the District in satisfying claims and/or suits and/or other obligations in connection with the Work.

22.2.3.5 In the event that the Site Lease and Facilities Lease are terminated for any reason, no allowances or compensation will be granted for the loss of any anticipated profit by the Developer or any impact or impairment of Developer's bonding capacity.

22.2.3.6 If the expense to the District to finish the Work exceeds the unpaid Guaranteed Maximum Price, Developer and Surety shall pay difference to District within twenty-one (21) days of District's request. District may apply any amounts otherwise due to Developer to this difference.

22.2.3.7 The District shall have the right (but shall have no obligation) to assume and/or assign to a replacement contractor or construction manager, or other third party who is qualified and has sufficient resources to complete the Work, the rights of the Developer under its subcontracts with any or all Subcontractors. In the event of an assumption or assignment by the District, no Subcontractor shall have any claim against the District or third party for Work performed by Subcontractor or other matters arising prior to termination of the Facilities Lease. The District or any third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after assumption or assignment. Should the District so elect, the Developer shall execute and deliver all documents and take all steps, including the legal assignment of its contractual rights, as the District may require, for the purpose of fully vesting in

the District the rights and benefits of its Subcontractors under Subcontracts or other obligations or commitments. Developer must include this assignment provision in all of its Facilities Leases with its Subcontractors.

22.2.3.8 All payments due the Developer hereunder shall be subject to a right of offset by the District for expenses, damages, losses, costs, claims, or reimbursements suffered by, or due to, the District as a result of any default, acts, or omissions of the Developer.

22.2.3.9 The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to District.

22.3 Termination of Developer for Convenience

22.3.1 District in its sole discretion may terminate the Facilities Lease upon five (5) days written notice to the Developer. Under a termination for convenience, the District retains the right to all the options available to the District if there is a termination for cause. In case of a termination for convenience, the Developer shall have no claims against the District except:

22.3.1.1 The actual cost for labor, materials, and services performed that is unpaid and adequately documented through timesheets, invoices, receipts, or otherwise; and

22.3.1.2 Five percent (5%) of the total cost of work performed as of the date of termination, or five percent (5%) of the value of the Work yet to be performed, whichever is less. This five percent (5%) amount shall be full compensation for all Developer's and its Subcontractor(s)' mobilization and/or demobilization costs and any anticipated lost profits resulting from termination of the Developer for convenience.

22.4 Developer Remedies Upon District Default

22.4.1 Events of Default by District Defined

The following shall be "Events of Default" of the District under this Facilities Lease. The terms "Event of Default" and "Default," whenever they are used as to the District in the Site Lease or this Facilities Lease, shall only mean one or more of the following events:

22.4.1.1 Failure by the District to pay payments required pursuant to the Guaranteed Maximum Price Provisions in Exhibit C, and the continuation of this failure for a period of forty-five (45) days.

22.4.1.2 Failure by the District to perform any material covenant, condition or agreement in this Facilities Lease and that failure continues for a period of forty-five (45) days after Developer provides District with written notice specifying that failure and requesting that the failure be remedied; provided, however, if the failure stated in the notice cannot be corrected within the applicable period, Developer shall not withhold its consent to an extension of time if corrective action is instituted by the District within the applicable period and diligently pursued until the default is corrected.

22.4.2 Remedies on District's Default

If there has been an Event of Default on the District's part, the Developer may exercise any and all remedies granted pursuant to this Facilities Lease; provided, however, there shall be no right under any circumstances to accelerate any of the payments required pursuant to the Guaranteed Maximum Price Provisions in **Exhibit C** or otherwise declare those payments not then past due to be immediately due and payable.

22.4.2.1 Developer may rescind its leaseback of the Project Site to the District under this Facilities Lease and re-rent the Project Site to another lessee for the remaining Term for no less than the fair market value for leasing the Project Site, which shall be:

22.4.2.1.1 An amount determined by a mutually-agreed upon appraiser; or

22.4.2.1.2 If an appraiser cannot be agreed to, an amount equal to the mean between a District appraisal and a Developer appraisal for the Project Site, both prepared by MAI-certified appraisers.

22.4.2.2 District's obligation to make the payments required pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C shall be:

22.4.2.2.1 Increased by the amount of costs, expenses, and damages incurred by the Developer in re-renting the Project Site; and

22.4.2.2.2 Decreased by the amount of rent Developer receives in re-letting the Project Site.

22.4.2.3 The District agrees that the terms of this Facilities Lease constitute full and sufficient notice of the right of Developer to re-rent the Project Site in the Event of

Default without effecting a surrender of this Facilities Lease, and further agrees that no acts of Developer in re-renting as permitted herein shall constitute a surrender or termination of this Facilities Lease, but that, on the contrary, in the event of an Event of Default by the District the right to re-rent the Project Site shall vest in Developer as indicated herein.

22.4.3 District's Continuing Obligation

Unless there has been damage, destruction, a Taking, or the Developer has acted, failed to act, or is in default as indicated above providing District with the right to terminate for cause, the District shall continue to remain liable for the payments required pursuant to the Guaranteed Maximum Price Provisions in **Exhibit C** and those amounts shall be payable to Developer at the time and in the manner therein provided.

22.4.4 No Remedy Exclusive

No remedy herein conferred upon or reserved to Developer is intended to be exclusive and every such remedy shall be cumulative and shall be in addition to every other remedy given under this Facilities Lease or now or hereafter existing at law or in equity. No delay or omission to exercise any right or power accruing upon any Default shall impair any such right or power or shall be construed to be a waiver thereof, but any such right and power may be exercised from time to time and as often as may be deemed expedient. In order to entitle Developer to exercise any remedy reserved to it in this article, it shall not be necessary to give any notice, other than such notice as may be required in this Article or by law.

22.5 Suspension of Work

22.5.1 District in its sole discretion may suspend, delay or interrupt the Work in whole or in part for such period of time as the District may determine upon three (3) days written notice to the Developer.

22.5.1.1 An adjustment may be made for changes in the cost of performance of the Work caused by any suspension, delay or interruption. No adjustment shall be made to the extent:

22.5.1.1.1 That performance is, was or would have been so suspended, delayed or interrupted by another cause for which Developer is responsible; or

22.5.1.1.2 That an equitable adjustment is made or denied under another provision of the Site Lease or the Facilities Lease; or

22.5.1.1.3 That the suspension of Work was the direct or indirect result of Developer's failure to perform any of its obligations hereunder.

22.5.1.2 Any adjustments in cost of performance may have a fixed or percentage fee as provided in the section on Format for Proposed Change Order in Exhibit D. This amount shall be full compensation for all Developer's and its Subcontractor(s)' changes in the cost of performance of the Facilities Lease caused by any such suspension, delay or interruption.

23. Notices

All notices, certificates or other communications hereunder shall be sufficiently given and shall be deemed to have been received five (5) days after deposit in the United States mail in registered or certified form with postage fully prepaid or one (1) business day after deposit with an overnight delivery service with proof of actual delivery:

If to District:

San Rafael City Schools
310 Nova Albion Way, Room 505
San Rafael, CA 94903
Attn: Dr. Daniel Zaich, Senior Director
Capital Facilities Department

If to Developer:

BHM Construction, Inc.
221 Gateway Road W. Ste. 405
Napa, CA 94558
Attn: Jeffrey Mazet, President

With a copy to:

Lauren M. Charneski, Esq.
Dannis Woliver Kelley
275 Battery Street, Suite 1150
San Francisco, CA 94111

The Developer and the District, by notice given hereunder, may designate different addresses to which subsequent notices, certificates or other communications will be sent.

24. Binding Effect

This Facilities Lease shall inure to the benefit of and shall be binding upon Developer and the District and their respective successors, transferees and assigns.

25. No Additional Waiver Implied by One Waiver

In the event any agreement contained in this Facilities Lease should be breached by either party and thereafter waived by the other party, such waiver shall be limited to the particular breach so waived and shall not be deemed to waive any other breach hereunder.

26. Severability

In the event any provision of this Facilities Lease shall be held invalid or unenforceable by any court of competent jurisdiction, that holding shall not invalidate or render unenforceable any other provision hereof, unless elimination of the invalid provision materially alters the rights and obligations embodied in this Facilities Lease or the Site Lease.

27. Amendments, Changes and Modifications

Except as to the termination rights of both Parties as indicated herein, this Facilities Lease may not be amended, changed, modified, altered or terminated without the written agreement of both Parties hereto.

28. Net-Net-Net Lease

This Facilities Lease shall be deemed and construed to be a "net-net-net lease" and the District hereby agrees that all payments it makes pursuant to the Guaranteed Maximum Price Provisions in **Exhibit C** shall be an absolute net return to Developer, free and clear of any expenses, charges or set-offs.

29. Execution in Counterparts

This Facilities Lease may be executed in several counterparts, each of which shall be an original and all of which shall constitute one and the same instrument.

30. Developer and District Representatives

Whenever under the provisions of this Facilities Lease the approval of Developer or the District is required, or Developer or the District is required to take some action at the request of the other, the approval or request shall be given for Developer by Developer's Representative and for the District by the District's Representative, and any party hereto shall be authorized to rely upon any such approval or request.

31. Applicable Law

This Facilities Lease shall be governed by and construed in accordance with the laws of the State of California, and venued in the County within which the School Site is located.

32. Attorney's Fees

If either party brings an action or proceeding involving the Property or to enforce the terms of this Facilities Lease or to declare rights hereunder, each party shall bear the cost of its own attorneys' fees.

33. Captions

The captions or headings in this Facilities Lease are for convenience only and in no way define, limit or describe the scope or intent of any provisions or sections of this Facilities Lease.

34. Prior Agreements

This Facilities Lease and the corresponding Site Lease collectively contain all of the agreements of the Parties hereto with respect to any matter covered or mentioned in this Facilities Lease and no prior agreements or understanding pertaining to any matter shall be effective for any purpose.

35. Further Assurances

Parties shall promptly execute and deliver all documents and instruments reasonably requested to give effect to the provisions of this Facilities Lease.

36. Recitals and Exhibits Incorporated

The Recitals set forth at the beginning of this Facilities Lease and the attached Exhibits are hereby incorporated into its terms and provisions by this reference.

37. Time of the Essence

Time is of the essence with respect to each of the terms, covenants, and conditions of this Facilities Lease.

38. Force Majeure

A party shall be excused from the performance of any obligation imposed in this Facilities Lease and the exhibits hereto for any period and to the extent that a party is prevented from performing that obligation, in whole or in part, as a result of delays caused by the other party or third parties, a governmental agency or entity, an act of God, war, terrorism, civil disturbance, forces of nature, fire, flood, earthquake, strikes or lockouts, and that non-performance will not be a default hereunder or a grounds for termination of this Facilities Lease.

39. Interpretation

None of the Parties hereto, nor their respective counsel, shall be deemed the drafters of this Facilities Lease for purposes of construing the provisions thereof. The language in all parts of this Facilities Lease shall in all cases be construed according to its fair meaning, not strictly for or against any of the Parties hereto.

IN WITNESS WHEREOF, the Parties have caused this Facilities Lease to be executed by their respective officers who are duly authorized, as of the Effective Date.

ACCEPTED AND AGREED on the date indicated below:

Dated: _____, 2018

Dated: November 06 2018

San Rafael City Schools

BHM Construction

By: _____

By:  _____

Name: Michael Watenpaugh

Name: Jeffrey Mazet

Title: Superintendent

Title: President

EXHIBIT A

LEGAL DESCRIPTION OF SCHOOL SITE

Attached is the Legal Description for:

Terra Linda High School New Commons, Kitchen, Library, Drama, Music and Classroom Building Project
320 Nova Albion Way
San Rafael, CA 94903

Portions of the parcel described below, project site as shown on Exhibit B, and all access drive areas as required.

PARCEL ONE:

BEGINNING at a point in the Freitas Ranch, said point being S 22 ° 16' W 3599.34 feet from a concrete monument lying Northwesterly of Lot 44, Terra Linda #1 Map hereinafter mentioned, said monument being set at the Northeasterly end of and 5 feet Northwesterly at right angles from the Northeasterly end of course N 7° 50' E 197 feet on Las Gallinas Drive as said concrete monument is laid down and delineated on that certain map entitled Map of Terra Linda #1, filed for record March 17, 1954, In Map Book 8, at Page 4, Marin County Records; and running thence S 80° 16' 30" W 368.18 feet; thence S 44° 00' W 432.20 feet, thence S 9° 00' 30" W 302.20 feet, thence S 23° 07' E 399.88 feet, thence S 54° 15' E 401.25 feet, thence S 70° 34' 15" E 684.92 feet, thence N 39° 03' E 768.56 feet, thence N 66° 26' 45" W 691.84 feet, thence N 35° 23' 30" W 328.02 feet, thence N 13° 45' W 369.84 feet to the point of beginning.

A.P.N. 175-060-31

EXHIBIT B

DESCRIPTION OF PROJECT SITE

Attached is a diagram of the School Site that is subject to this Facilities Lease and upon which Developer will construct the Project.

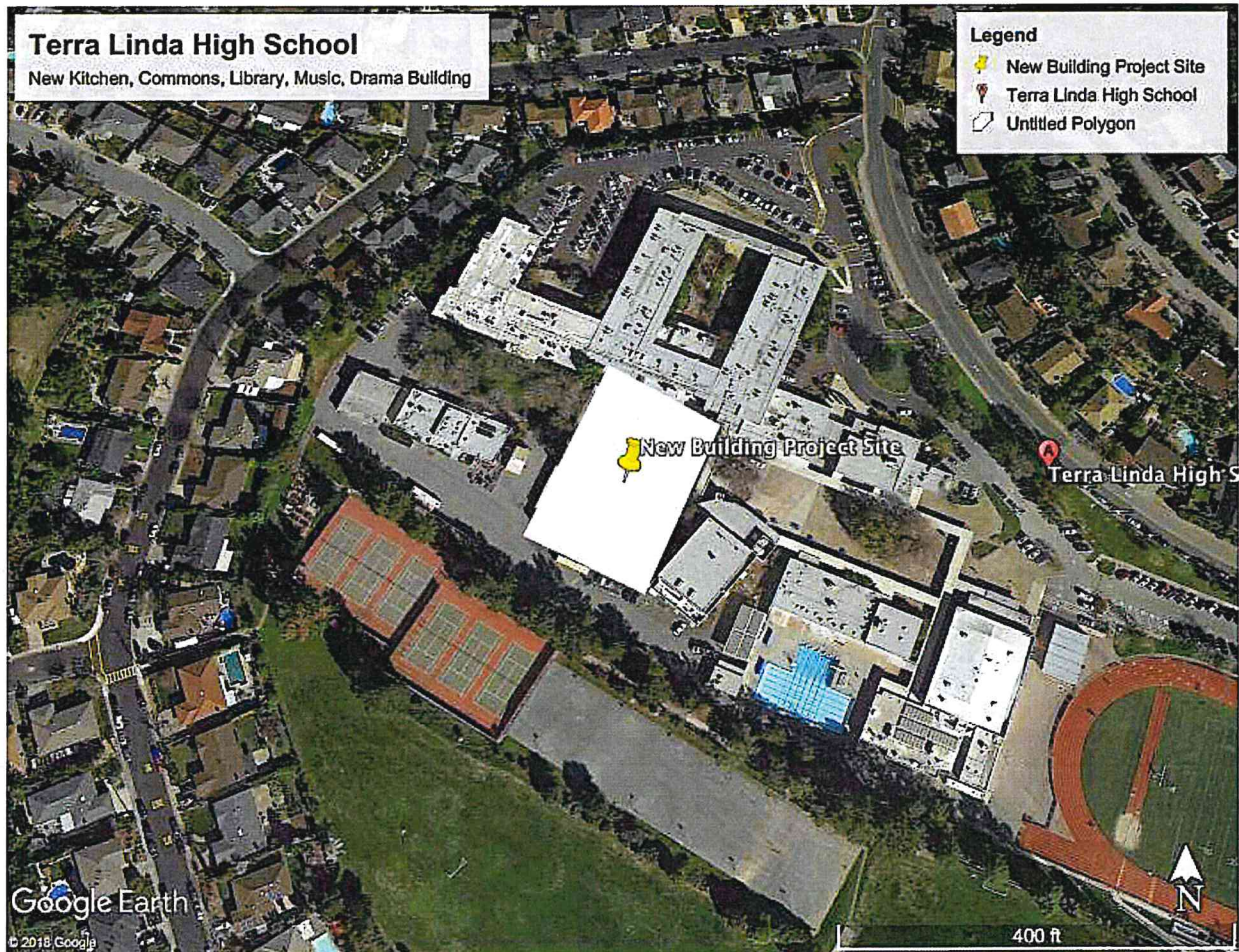


EXHIBIT C

GUARANTEED MAXIMUM PRICE AND

OTHER PROJECT COST, FUNDING, AND PAYMENT PROVISIONS

Attached are the terms and provisions related to Site Lease payments, the Facilities Lease, the Guaranteed Maximum Price and other related cost, funding, and payment provisions.

EXHIBIT C
GUARANTEED MAXIMUM PRICE AND
OTHER PROJECT COST, FUNDING, AND PAYMENT PROVISIONS

40. **Site Lease Payments**

As indicated in the Site Lease, Developer shall pay One Dollar (\$1.00) to the District as consideration for the Site Lease.

41. **Guaranteed Maximum Price**

Pursuant to the Facilities Lease, Developer will cause the Project to be constructed for an amount to be determined after the Division of the State Architect ("DSA") approves the plans and specification for the Project ("Guaranteed Maximum Price").

41.1 Cost of the Work

The term Cost of the Work shall mean the costs necessarily incurred in the proper performance of the Work contemplated by the Contract Documents. Such costs shall be at rates no higher than the standard paid at the place of the Project except with the prior consent of the District. The Cost of the Work shall include only the items set forth in this Section 2 and approved by the District.

41.1.1 General Conditions

The General Conditions as set forth in **Attachment 1** hereto shall be included in a progress billing as incurred. Said rates shall include all costs for labor, equipment and materials for the items identified therein which are necessary for the proper management of the Project, and shall include all costs paid or incurred by the Developer for insurance, permits, taxes, and all contributions, assessments and benefits, holidays, vacations, retirement benefits, incentives to the extent contemplated in **Attachment 1**, whether required by law or collective bargaining agreements or otherwise paid or provided by Developer to its employees. The District reserves the right to request changes to the personnel, equipment, or facilities provided as General Conditions as may be necessary or appropriate for the proper management of the Project, in which case, the District shall be entitled to a reduction in the cost of General Conditions based on the rates set forth in **Attachment 1**.

41.1.2 Subcontract Costs

Payments made by the Developer to Subcontractors (inclusive of the Subcontractor's bonding, if required, and insurance costs, which shall be included in the subcontract amount), which payments shall be made in accordance with the requirements of the Contract Documents.

41.1.3 Developer-Performed Work

Costs incurred by the Developer for self-performed work at the direction of District or with the District's prior approval, as follows:

41.1.3.1 Actual costs to the Developer of wages of construction workers, excluding all salaried and/or administrative personnel, directly employed by the Developer to perform the construction of the Work at the site.

41.1.3.2 Wages or salaries and customary benefits, such as sick leave, medical and health benefits, holidays, vacations, incentive programs, and pension plans of the Developer's field supervisory, safety and administrative personnel when stationed at the site or stationed at the Developer's principal office, only for that portion of their time required for the Work.

41.1.3.3 Wages and salaries and customary benefits, such as sick leave, medical and health benefits, holidays, vacations, incentive programs and pension plans of the Developer's supervisory or administrative personnel engaged at factories, workshops or on the road, in expediting the production or transportation of materials or equipment required for the Work, but only for that portion of their time required for the Work.

41.1.3.4 Costs paid or incurred by Developer for taxes, insurance, contributions, assessments required by law or collective bargaining agreements and for personnel not covered by such agreements, and for customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, provided such costs are based on wages and salaries included in the Cost of the Work under Subparagraphs 2.1.3.1 through 2.1.3.3.

41.1.3.5 Costs, including transportation and storage, of materials and equipment incorporated in the completed construction, including costs of materials in excess of those actually installed to allow for reasonable waste and spoilage. Unused excess materials, if any, shall become the District's property at the completion of the Work or, at the District's option, shall be sold by the Developer. Any amounts realized from such sales shall be credited to the District as a deduction from the Cost of the Work.

41.1.3.6 Costs, including transportation and storage, installation, maintenance, dismantling and removal of materials, supplies, machinery and equipment not customarily owned by construction workers, that are provided by the Developer at the site and fully consumed in the performance of the Work; and cost (less salvage value) of such items if not fully consumed, whether sold to others or retained by the Developer. Cost for items previously used by the Developer shall mean fair market value.

41.1.3.7 Rental charges for temporary facilities, machinery, equipment, vehicles and vehicle expenses, and hand tools not

customarily owned by construction workers that are provided by the Developer at the site, whether rented from the Developer or others, and the costs of transportation, installation, minor repairs and replacements, dismantling and removal thereof and costs of Developer's Project field office, overhead and general expenses including office supplies, parking, office equipment, and software. Rates and quantities of equipment rented shall be subject to the District's prior approval.

41.1.3.8 Costs of removal of debris from the site, daily clean up costs and dumpster charges not otherwise included in the cost of the subcontracts which exceeds the clean-up provided under the General Conditions.

41.1.3.9 Costs of that portion of the reasonable travel, parking and subsistence expenses of the Developer's personnel incurred while traveling and discharging duties connected with the Work.

41.1.3.10 Costs of materials and equipment suitably stored off the site at a mutually acceptable location, if approved in advance by the District.

41.1.4 Allowances

Because it is impossible at the time of execution of the Facilities Lease to determine the exact cost of performing certain tasks, the Cost of the Work shall include the following Allowances for the Tasks/Work as noted here:

Task/Work	Allowance Amount
Total Allowance Amount	

The District shall have sole discretion to authorize all expenditures from the Allowances. The District shall process expenditures from the Allowances in the form of an Allowance Expenditure Directive ("AED"). The Allowances are included in the Guaranteed Maximum Price. Any unused Allowance or unused portion thereof shall be deducted from the Cost of the Work pursuant to **Exhibit D** to this Facilities Lease to the benefit of the District.

41.1.5 Miscellaneous Costs

41.1.5.1 Where not included in the General Conditions, and with the prior approval of District, costs of document reproductions (photocopying and blueprinting expenses), long distance telephone call charges, postage, overnight and parcel delivery charges, telephone costs including cellular telephone charges, facsimile or other communication service at the Project site, job photos and progress schedules, and reasonable petty cash expenses of the site office. Developer shall consult with District to determine whether District has any vendor relationships that could reduce the cost of these items and use such vendors whenever possible.

41.1.5.2 Sales, use, gross receipts, local business and similar taxes imposed by a governmental authority that are related to the Work.

41.1.5.3 Fees and assessments for permits, plan checks, licenses and inspections for which Developer is required by the Contract Documents to pay including, but not limited to, permanent utility connection charges, street use permit, street use rental, OSHA permit and sidewalk use permit and fees.

41.1.5.4 Fees of laboratories for tests required by the Contract Documents.

41.1.5.5 Deposits lost for causes other than the Developer's or its subcontractors' negligence or failure to fulfill a specific responsibility to the District as set forth in the Contract Documents.

41.1.5.6 Expenses incurred in accordance with the Developer's standard personnel policy for relocation and temporary living allowances of personnel required for the Work if approved in advance by District.

41.1.5.7 Where requested by District, costs or expenses incurred by Developer in performing design services for the design-build systems.

41.1.5.8 Other costs incurred in the performance of the Work if, and to the extent, approved in advance by District.

41.1.5.9 Costs due to emergencies incurred in taking action to prevent threatened damage, injury or loss in case of an emergency affecting the safety of persons and/or property.

41.1.5.10 Provided all other eligible costs have been deducted from the contingency and as part of the calculation of amounts due Developer for Final Payment, costs of repairing and correcting damaged or non-conforming Work executed by the Developer, Subcontractors or suppliers, providing that such damage or non-conforming Work was not caused by negligence or failure to fulfill a specific responsibility of the Developer and only to the extent that the cost of repair or correction is not recovered by the Developer from insurance, sureties, Subcontractors or suppliers.

41.1.6 Excluded Costs

The following items are considered general overhead items and shall not be billed to the District:

41.1.6.1 Salaries and other compensation of the Developer's personnel stationed at Developer's principal office or offices other than the Project Field Office, except as specifically provided in Subparagraphs 2.1.3.2. and 2.1.3.4.

41.1.6.2 Expenses of the Developer's principal office and offices other than the Project Field Office.

41.1.6.3 Overhead and general expenses, except as may be expressly included in this Section 2.

41.1.6.4 The Developer's capital expenses, including interest on the Developer's capital employed for the Work.

41.1.6.5 Costs that would cause the Guaranteed Maximum Price (as adjusted by Change Order) to be exceeded.

41.1.7 Developer's Fee

_____ percent (____%) of the Cost of the Work as described in Section 2.1.

41.1.8 Bonds and Insurance

For insurance and bonds required under this Facilities Lease (exclusive of those required by Subcontractors, which costs are included in the subcontract amounts), that portion of insurance and bond premiums which are directly attributable to this Contract, which shall be calculated at a rate of _____ percent (____%) of the Cost of the Work for insurance and _____ percent (____%) of the Cost of the Work for payment and performance bonds.

41.1.9 Contingency

41.1.9.1 The Guaranteed Maximum Price includes a Developer Contingency of _____ percent (____%) of the Cost of the Work as described in Section 2.1.1, 2.1.2, and 2.1.3 for potential additional construction costs for District requested changes, unforeseen conditions that occur over the course of construction and/or scope gaps between the subcontract categories of the Work.

41.1.9.2 The Developer Contingency is not intended for such things as scope changes.

41.1.9.3 The Contingency shall not be used without the agreement of the District.

41.1.9.4 The unused portion of the Developer Contingency shall be considered as cost savings and retained by the District at the end of the Project.

41.2 The Guaranteed Maximum Price will consist of the amounts to be identified in Attachment 2 to this Exhibit C. Except as indicated herein for modifications to the Project approved by the District, Developer will not seek additional compensation from District in excess of Guaranteed Maximum Price. District shall pay the Guaranteed Maximum Price to Developer in the form of Tenant Improvement Payments and Lease Payments as indicated herein.

41.3 Total Payment

In no event shall the cumulative total of the Tenant Improvement Payments and the Lease Payments ever exceed the Guaranteed Maximum Price to be defined, as may be modified pursuant to **Exhibit D** to the Facilities Lease.

41.4 Changes to Guaranteed Maximum Price

41.4.1 The Parties acknowledge that the Guaranteed Maximum Price is based on the Construction Documents, including the plans and specifications, as identified in Exhibit D to the Facilities Lease.

41.4.2 As indicated in the Facilities Lease, the Parties may add to or remove from the project specific scopes of work. Based on these change(s), the Parties may agree to a reduction or increase in the Guaranteed Maximum Price. If a cost impact of a change is agreed to by the Parties, it shall be paid upon the payment request from the Developer for the work that is the subject of the change in accordance with the provisions of Exhibit D. The amount of any change to the Guaranteed Maximum Price shall be calculated in accordance with the provisions of Exhibit D to this Facilities Lease.

41.4.3 The Parties agree to reduce the Guaranteed Maximum Price for the unused portion of the Developer Contingency, if any.

41.4.4 Cost Savings

Developer shall work cooperatively with Architect, Construction Manager, subcontractors and District, in good faith, to identify appropriate opportunities to reduce the Project costs and promote cost savings. Any identified cost savings from the Guaranteed Maximum Price shall be identified by Developer and approved in writing by the District. If any cost savings require revisions to the Construction Documents, Developer shall work with the District and Architect with respect to revising the Construction Documents and, if necessary, obtaining the approval of DSA with respect to those revisions. Developer shall be entitled to an adjustment of Contract Time for delay in completion caused by any cost savings adopted by District pursuant to **Exhibit D**, if requested in writing before the approval of the cost savings.

41.4.5 If the District exercises its Purchase Option pursuant to this Exhibit C, any reduction in the Guaranteed Maximum Price resulting from that exercise of the Purchase Option, if any, shall be retained in full by the District and shall not be shared with the Developer.

41.4.6 If the Parties agree to a reduction or increase in the Guaranteed Maximum Price, the Loan Amount indicated in Attachment 3 shall be adjusted accordingly and Attachment 3 shall be amended prior to the commencement of Lease Payments.

42. **Tenant Improvement Payments**

Prior to the District's taking delivery or occupancy of the Project, the District shall pay to Developer an amount equal to the Guaranteed Maximum Price as modified pursuant to the terms of the Facilities Lease, including **Exhibit C** and **Exhibit D**, less the Lease Payments ("Tenant Improvement Payments"). Tenant Improvement Payments will be processed based on the amount of Work performed according to the Developer's Schedule of Values (**Exhibit G** to the Facilities Lease) and pursuant to the provisions in **Exhibit D** to the Facilities Lease, including withholding for or escrow of retention of five percent (5%) of the Guaranteed Maximum Price.

43. **Lease Payments**

Upon execution of the Memorandum of Commencement Date, the form of which is attached to the Facilities Lease as **Exhibit E**, the District shall commence making lease payments to Developer in accordance with the Schedule attached hereto as **Attachment 3**.

43.1 The Lease Payments shall be consideration for the District's rental, use, and occupancy of the Project and the Project Site and shall be made in monthly installments as indicated in the Schedule of Lease Payments attached hereto as Attachment 3 for the duration of the lease term of one (1) year, with the first Lease Payment due ninety (90) days after execution of the Memorandum of Commencement Date.

43.2 The District represents that the annual Lease Payment obligation does not surpass the District's annual budget and will not require the District to increase or impose additional taxes or obligations on the public that did not exist prior to the execution of the Facilities Lease.

43.3 Fair Rental Value

District and Developer have agreed and determined that the total Lease Payments constitute adequate consideration for the Facilities Lease and are reasonably equivalent to the fair rental value of the Project. In making such determination, consideration has been given to the obligations of the Parties under the Facilities Lease and Site Lease, the uses and purposes which may be served by the Project and the benefits therefrom which will accrue to the District and the general public.

43.4 Each Lease Payment Constitutes a Current Expense of the District

43.4.1 The District and Developer understand and intend that the obligation of the District to pay Lease Payments and other payments hereunder constitutes a current expense of the District and shall not in any way be construed to be a debt of the District in contravention of any applicable constitutional or statutory limitation or requirement concerning the creation of indebtedness by the District, nor shall anything contained herein constitute a pledge of the general tax revenues, funds or moneys of the District.

43.4.2 Lease Payments due hereunder shall be payable only from current funds which are budgeted and appropriated or otherwise made legally available for this purpose. This Facilities Lease shall not create an immediate indebtedness for any aggregate payments that may become due hereunder.

43.4.3 The District covenants to take all necessary actions to include the Lease Payments in each of its final approved annual budgets.

43.4.4 The District further covenants to make all necessary appropriations (including any supplemental appropriations) from any source of legally available funds of the District for the actual amount of Lease Payments that come due and payable during the period covered by each such budget. Developer acknowledges that the District has not pledged the full faith and credit of the District, State of California or any state agency or state department to the payment of Lease Payments or any other payments due hereunder. The covenants on the part of District contained in this Facilities Lease constitute duties imposed by law and it shall be the duty of each and every public official of the District to take such action and do such things as are required by law in the performance of the official duty of such officials to enable the District to carry out and perform the covenants and agreements in this Facilities Lease agreed to be carried out and performed by the District.

43.4.5 The Developer cannot, under any circumstances, accelerate the District's payments under the Facilities Lease.

44. **District's Purchase Option**

44.1 If the District is not then in uncured Default hereunder, the District shall have the option to purchase not less than all of the Project in its "as-is, where-is" condition and terminate this Facilities Lease and Site Lease by paying the balance of the "Loan Amount" identified in Attachment 3, which is exclusive of interest that would have otherwise been owed, as of the date the option is exercised ("Option Price"). Said payment shall be made on or before the date on which the District's lease payment would otherwise be due for that month ("Option Date").

44.2 District shall provide to Developer a written notice no less than ten (10) days prior to the Option Date. The notice will include that District is exercising its option to purchase the Project as set forth above on the Option Date. If the District exercises this option, the District shall pay directly to Developer the Option Price on or prior to the Option Date and Developer shall at that time deliver to District an executed Termination Agreement and Quitclaim Deed in recordable form to terminate this

Facilities Lease and the Site Lease. District may record all such documents at District's cost and expense.

44.3 Under no circumstances can the first Option Date be on or before ninety (90) days after the Developer completes the Project and the District accepts the Project.

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ATTACHMENT 1
GENERAL CONDITIONS COSTS

ATTACHMENT 2
GUARANTEED MAXIMUM PRICE

To be attached.

ATTACHMENT 3
SCHEDULE OF LEASE PAYMENTS

Amortization Schedule

Loan Amount: \$
Interest: ___% Annual
Term in Months _____
Payment
Frequency Monthly

<u>Payment #</u>	<u>Total Payment</u>	<u>Principal Payment</u>	<u>Interest Payment</u>	<u>Balance</u>
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Totals				

EXHIBIT D

GENERAL CONSTRUCTION PROVISIONS

Attached are the general construction terms and conditions for the Project.

EXHIBIT D

**GENERAL CONSTRUCTION PROVISIONS
FOR THE FOLLOWING PROJECT:**

**Terra Linda High School New Commons, Kitchen,
Library, Drama, Music and Classroom Building
Project**

BY AND BETWEEN

SAN RAFAEL CITY SCHOOLS

AND

BHM Construction, Inc.

Dated as of November 14, 2018

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1. Contract Terms and Definitions

37.1. Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

37.1.1. Adverse Weather. Shall be only weather that satisfies all of the following conditions: (1) unusually severe precipitation, sleet, snow, hail, or extreme temperature conditions in excess of the norm for the location and time of year it occurred based on the closest weather station data averaged over the past five years, (2) that is unanticipated and would cause unsafe work conditions and/or is unsuitable for scheduled work that should not be performed during inclement weather (i.e., exterior finishes), and (3) at the Project.

37.1.2. Approval, Approved, and/or Accepted. Written authorization, unless stated otherwise.

37.1.3. Architect (or "Design Professional in General Charge"). The individual, partnership, corporation, joint venture, or any combination thereof, named as Architect, who will have the rights and authority assigned to the Architect in the Contract Documents. The term Architect means the Design Professional in General Responsible Charge as defined in DSA PR 13-02 on this Project or the Architect's authorized representative.

37.1.4. As-Builts. Reproducible blue line prints of drawings to be prepared on a monthly basis pursuant to the Contract Documents, that reflect changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed since the preceding monthly submittal. See **Record Drawings**.

37.1.5. Change Order. A written order to the Developer authorizing an addition to, deletion from, or revision in the Work, and/or authorizing an adjustment in the Guaranteed Maximum Price or Contract Time.

37.1.6. Claim. A Dispute that remains unresolved at the conclusion of all the applicable Dispute Resolution requirements provided herein.

37.1.7. Completion. The earliest of the date of acceptance by the District or the cessation of labor thereon for a continuous period of sixty (60) days.

37.1.8. Construction Change Directive. A written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work.

37.1.9. Construction Manager. The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Construction Manager is used on the Project that is the subject of this Contract, then all references to Construction Manager herein shall be read to refer to District.

37.1.10. Construction Schedule. The progress schedule of construction of the Project as provided by Developer and approved by District.

37.1.11. Contract. The agreement between the District and Developer contained in the Contract Documents.

37.1.12. Contract Documents. The Contract Documents consist exclusively of the documents evidencing the agreement of the District and Developer. The Contract Documents consist of the following documents:

37.1.12.1 Non-Collusion Declaration

37.1.12.2 Site Lease

37.1.12.3 Facilities Lease, including Exhibits A- G

37.1.12.3.1. Performance Bond

37.1.12.3.2. Payment Bond (Developer's Labor & Material Bond)

37.1.12.3.3. [RESERVED]

37.1.12.3.4. Hazardous Materials Procedures and Requirements

37.1.12.3.5. Workers' Compensation Certification

37.1.12.3.6. Prevailing Wage Certification

37.1.12.3.7. Disabled Veterans Business Enterprise Participation Certification (if applicable)

37.1.12.3.8. Drug-Free Workplace Certification

37.1.12.3.9. Tobacco-Free Environment Certification

37.1.12.3.10. Hazardous Materials Certification

37.1.12.3.11. Lead-Based Materials Certification (if applicable)

37.1.12.3.12. Imported Materials Certification (if applicable)

37.1.12.3.13. Criminal Background Investigation/Fingerprinting Certification

37.1.12.3.14. Roofing Project Certification

37.1.12.3.15. Iran Contracting Act Certification

37.1.12.3.16. Skilled and Trained Workforce Certification

37.1.12.3.17. Escrow Agreement for Security Deposits in Lieu of Retention (if used)

37.1.12.3.18. Agreement and Release of Any and All Claims

37.1.12.4 All Plans, Technical Specifications, and Drawings

37.1.12.5 Any and all addenda to any of the above documents

37.1.12.6 Any and all change orders or written modifications to the above documents if approved in writing by the District

37.1.13. Contract Time. The time period stated in the Facilities Lease for the completion of the Work.

37.1.14. Daily Job Report(s). Daily Project reports prepared by the Developer's employee(s) who are present on Site, which shall include the information required herein.

37.1.15. Day(s). Unless otherwise designated, day(s) means calendar day(s).

37.1.16. Department of Industrial Relations (or "DIR"). DIR is responsible, among other things, for labor compliance monitoring and enforcement of California prevailing wage laws and regulations for public works contracts.

37.1.17. Design Professional in General Responsible Charge. See definition of Architect above.

37.1.18. Developer. The person or persons identified in the Facilities Lease as contracting to perform the Work to be done under this Contract, or the legal representative of such a person or persons.

37.1.19. Dispute. A separate demand by Developer for a time extension, or payment of money or damages arising from Work done by or on behalf of the Developer pursuant to the Contract and payment of which is not otherwise expressly provided for or Developer is not otherwise entitled to; or an amount of payment disputed by the District.

37.1.20. District. The public agency or the school district for which the Work is performed. The governing board of the District or its designees will act for the District in all matters pertaining to the Contract. The District may, at any time:

37.1.20.1 Direct the Developer to communicate with or provide notice to the Construction Manager or the Architect on matters for which the Contract Documents indicate the Developer will communicate with or provide notice to the District; and/or

37.1.20.2 Direct the Construction Manager or the Architect to communicate with or direct the Developer on matters for which the Contract Documents indicate the District will communicate with or direct the Developer.

37.1.21. Drawings (or "Plans"). The graphic and pictorial portions of the Contract Documents showing the design, location, scope and dimensions of the Work, generally including plans, elevations, sections, details, schedules, sequence of operation, and diagrams.

37.1.22. DSA. Division of the State Architect.

37.1.23. Force Account Directive. A process that may be used when the District and the Developer cannot agree on a price for a specific portion of work or before the Developer prepares a price for a specific portion of work

and whereby the Developer performs the work as indicated herein on a time and materials basis.

37.1.24. Guaranteed Maximum Price. The total monies payable to the Developer under the terms and conditions of the Contract Documents.

37.1.25. Job Cost Reports. Any and all reports or records detailing the costs associated with work performed on or related to the Project that Developer shall maintain for the Project. Specifically, Job Cost Reports shall contain, but are not limited by or to, the following information: a description of the work performed or to be performed on the Project; quantity, if applicable, of work performed (hours, square feet, cubic yards, pounds, etc.) for the Project; Project budget; costs for the Project to date; estimated costs to complete the Project; and expected costs at completion. The Job Cost Reports shall also reflect all Contract cost codes, change orders, elements of non-conforming work, back charges, and additional services.

37.1.26. Labor Commissioner's Office (or "Labor Commissioner"). Also known as the Division of Labor Standards Enforcement ("DLSE"): Division of the DIR responsible for adjudicating wage claims, investigating discrimination and public works complaints, and enforcing Labor Code statutes and Industrial Welfare Commission orders.

37.1.27. Material Safety Data Sheets (or "MSDS"). A form with data regarding the properties for potentially harmful substances handled in the workplace.

37.1.28. Municipal Separate Storm Sewer System (or "MS4"). A system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

37.1.29. Plans. See "Drawings."

37.1.30. Premises. The real property on which the Site is located.

37.1.31. Product(s). New material, machinery, components, equipment, fixtures and systems forming the Work, including existing materials or components required and approved by the District for reuse.

37.1.32. Product Data. Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Developer to illustrate a material, product, or system for some portion of the Work.

37.1.33. Project. The planned undertaking as provided for in the Contract Documents.

37.1.34. Project Inspector (or "Inspector"). The individual(s) retained by the District in accordance with title 24 of the California Code of Regulations to monitor and inspect the Project.

37.1.35. Project Labor Agreement (or "PLA"). A prehire collective bargaining agreement in accordance with Public Contract Code section 2500 *et seq.* that establishes terms and conditions of employment for a specific construction project or projects and/or is an agreement described in Section 158(f) of Title 29 of the United States Code.

37.1.36. Program Manager. The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Program Manager is designated for the Project that is the subject of the Contract Documents, then all references to Program Manager herein shall be read to refer to District.

37.1.37. Proposed Change Order. A Proposed Change Order ("PCO") is a written request prepared by the Developer requesting that the District, the Construction Manager and the Architect issue a Change Order based upon a proposed change to the Work.

37.1.38. Provide. Shall include "provide complete in place," that is, "furnish and install," and "provide complete and functioning as intended in place" unless specifically stated otherwise.

37.1.39. Qualified SWPPP Practitioners ("QSP"). Certified personnel that attended a State Water Resources Control Board sponsored or approved training class and passed the qualifying exam.

37.1.40. Record Drawings. Unless otherwise defined in the Special Conditions, Reproducible drawings (or Plans) prepared pursuant to the requirements of the Contract Documents, that reflect all changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed upon completion of the Project. See also "As-Builts."

37.1.41. Request for Information ("RFI" or "RFIs"). A written request prepared by the Developer requesting that the Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that the Developer believes is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address problems that have arisen under field conditions.

37.1.42. Request for Substitution for Specified Item. A request by Developer to substitute an equal or superior material, product, thing, or service for a specific material, product, thing, or service that has been designated in the Contract Documents by a specific brand or trade name.

37.1.43. Safety Orders. Written and/or verbal orders for construction issued by the California Division of Occupational Safety and Health ("Cal/OSHA") or by the United States Occupational Safety and Health Administration ("OSHA").

37.1.44. Safety Plan. Developer's safety plan specifically adapted for the Project. Developer's Safety Plan shall comply with all provisions regarding Project safety, including all applicable provisions in these Construction Provisions.

37.1.45. Samples. Physical examples that illustrate materials, products, equipment, finishes, colors, or workmanship and that, when approved in accordance with the Contract Documents, establish standards by which portions of the Work will be judged.

37.1.46. Shop Drawings. All drawings, prints, diagrams, illustrations, brochures, schedules, and other data that are prepared by the Developer, a subcontractor, manufacturer, supplier, or distributor, that illustrate how specific portions of the Work shall be fabricated or installed.

37.1.47. Site. The Project site as shown on the Drawings.

37.1.48. Specifications. That portion of the Contract Documents, Division 1 through Division 49, and all technical sections, and addenda to all of these, if any, consisting of written descriptions and requirements of a technical nature of materials, equipment, construction methods and systems, standards, and workmanship.

37.1.49. State. The State of California.

37.1.50. Storm Water Pollution Prevention Plan (or "SWPPP"). A document which identifies sources and activities at a particular facility that may contribute pollutants to storm water and contains specific control measures and time frames to prevent or treat such pollutants.

37.1.51. Subcontractor. A contractor and/or supplier who is under contract with the Developer or with any other subcontractor, regardless of tier, to perform a portion of the Work of the Project.

37.1.52. Submittal Schedule. The schedule of submittals as provided by Developer and approved by District.

37.1.53. Surety. The person, firm, or corporation that executes as surety the Developer's Performance Bond and Payment Bond, and must be a California admitted surety insurer as defined in the Code of Civil Procedure section 995.120.

37.1.54. Work. All labor, materials, equipment, components, appliances, supervision, coordination, and services required by, or reasonably inferred from, the Contract Documents, that are necessary for the construction and completion of the Project.

37.2. Laws Concerning the Contract Documents

The Contract is subject to all provisions of the Constitution and laws of California and the United States governing, controlling, or affecting District, or the property, funds, operations, or powers of District, and such provisions are by this reference made a part hereof. Any provision required by law to be included in this Contract shall be deemed to be inserted.

37.3. No Oral Agreements

No oral agreement or conversation with any officer, agent, or employee of District, either before or after execution of Contract Documents, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract Documents.

37.4. No Assignment

Except as specifically permitted in the Facilities Lease, Developer shall not assign the Contract Documents or any part thereof including, without limitation, any services or money to become due hereunder without the prior written consent of the District. Assignment without District's prior written consent shall be null and void. Any assignment of money due or to become due under the Contract Documents shall be subject to a prior lien for services rendered or material supplied for performance of Work called for under the Contract Documents in favor of all persons, firms, or corporations rendering services or supplying material to the extent that claims are filed pursuant to the Civil Code, Code of Civil Procedure, Government Code, Labor Code, and/or Public Contract Code, and shall also be subject to deductions for liquidated damages or withholding of payments as determined by District in accordance with the Contract Documents. Developer shall not assign or transfer in any manner to a Subcontractor or supplier the right to prosecute or maintain an action against the District.

37.5. Notice and Service Thereof

37.5.1. Any notice from one party to the other or otherwise under the Contract Documents shall be in writing and shall be dated and signed by the party giving notice or by a duly authorized representative of that party. Notice shall not be effective for any purpose whatsoever unless served in one of the following manners:

37.5.1.1 If notice is given by personal delivery thereof, it shall be considered delivered on the day of delivery.

37.5.1.2 If notice is given by overnight delivery service, it shall be considered delivered one (1) day after date deposited, as indicated by the delivery service.

37.5.1.3 If notice is given by depositing same in United States mail, enclosed in a sealed envelope, it shall be considered delivered five (5) days after date deposited, as indicated by the postmarked date.

37.5.1.4 If notice is given by registered or certified mail with postage prepaid, return receipt requested, it shall be considered delivered on the day the notice is signed for.

37.6. No Waiver

The failure of District in any one or more instances to insist upon strict performance of any of the terms of the Contract Documents or to exercise any option herein

conferred shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion. No action or failure to act by the District, Architect, or Construction Manager shall constitute a waiver of any right or duty afforded the District under the Contract Documents, nor shall any action or failure to act constitute an approval of or acquiescence on any breach thereunder, except as may be specifically agreed in writing.

37.7. Substitutions For Specified Items

Developer shall not substitute different items for any items identified in the Contract Documents without prior written approval of the District, unless otherwise provided in the Contract Documents.

37.8. Materials and Work

37.8.1. Except as otherwise specifically stated in the Contract Documents, Developer shall provide and pay for all materials, labor, tools, equipment, transportation, supervision, temporary constructions of every nature, and all other services, management, and facilities of every nature whatsoever necessary to execute and complete the Work, in a good and workmanlike manner, within the Contract Time.

37.8.2. Unless otherwise specified, all materials shall be new and of the best quality of their respective kinds and grades as noted or specified, and workmanship shall be of high quality, and Developer shall use all diligence to inform itself fully as to the required manufacturer's instructions and to comply therewith.

37.8.3. Materials shall be furnished in ample quantities and at such times as to insure uninterrupted progress of Work and shall be stored properly and protected from the elements, theft, vandalism, or other loss or damage as required.

37.8.4. For all materials and equipment specified or indicated in the Drawings and Specifications, the Developer shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems, functioning as intended. Incidental items not indicated on Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized here in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer's most recent published recommendations and specifications.

37.8.5. Developer shall, after award of the Project by District and after relevant submittals have been approved, place orders for materials and/or equipment as specified so that delivery of same may be made without delays to the Work. Developer shall, upon demand from District, present documentary evidence showing that orders have been placed.

37.8.6. In the event of Developer's neglect in complying or failure to comply with the above instructions, District reserves the right, but has no obligation, to place orders for such materials and/or equipment as the District may deem advisable so that the Work may be completed by the date specified in the Facilities Lease, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Developer or deducted from payment(s) to Developer.

37.8.7. Developer warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver the Site to District, together with all improvements and appurtenances constructed or placed thereon by it, and free from any claims, liens, or charges. Developer further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract Documents shall have any right to lien any portion of the Premises or any improvement or appurtenance thereon, except that Developer may install metering devices or other equipment of utility companies or of political subdivision, title to which is commonly retained by utility company or political subdivision. In the event of installation of any such metering device or equipment, Developer shall advise District as to owner thereof.

37.8.8. Nothing contained in this Article, however, shall defeat or impair the rights of persons furnishing materials or labor under any bond given by Developer for their protection or any rights under any law permitting such protection or any rights under any law permitting such persons to look to funds due Developer in hands of District (e.g., Stop Payment Notices), and this provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for Work when no formal contract is entered into for such material.

37.8.9. Title to new materials and/or equipment for the Work of the Contract Documents and attendant liability for its protection and safety shall remain with Developer until incorporated in the Work of the Contract Documents and accepted by District. No part of any materials and/or equipment shall be removed from its place of storage except for immediate installation in the Work of the Contract Documents. Should the District, in its discretion, allow the Developer to store materials and/or equipment for the Work off-site, Developer will store said materials and/or equipment at a bonded warehouse and with appropriate insurance coverage at no cost to District. Developer shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to District or its authorized representative and shall, at the District's request, forward it to the District.

38. [Reserved]

39. Architect

39.1. The Architect shall represent the District during the Project and will observe the progress and quality of the Work on behalf of the District. Architect shall have the authority to act on behalf of District to the extent expressly provided in the Contract Documents and to the extent determined by District. Architect shall have authority to reject materials, workmanship, and/or the Work whenever rejection may

be necessary, in Architect's reasonable opinion, to insure the proper execution of the Contract Documents.

39.2. Architect shall, with the District and on behalf of the District, determine the amount, quality, acceptability, and fitness of all parts of the Work, and interpret the Specifications, Drawings, and shall, with the District, interpret all other Contract Documents.

39.3. Architect shall have all authority and responsibility established by law, including title 24 of the California Code of Regulations.

39.4. Developer shall provide District and the Construction Manager with a copy of all written communication between Developer and Architect at the same time as that communication is made to Architect, including, without limitation, all RFIs, correspondence, submittals, claims, and change order requests.

40. Construction Manager

40.1. If a Construction Manager is used on this Project ("Construction Manager" or "CM"), the Construction Manager will provide administration of the Contract Documents on the District's behalf. After execution of the Contract Documents, all correspondence and/or instructions from Developer and/or District shall be forwarded through the Construction Manager. The Construction Manager will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures or for safety precautions in connection with the Work, which shall all remain the Developer's responsibility.

40.2. The Construction Manager, however, will have authority to reject materials and/or workmanship not conforming to the Contract Documents, as determined by the District, the Architect, and/or the Project Inspector. The Construction Manager shall also have the authority to require special inspection or testing of any portion of the Work, whether it has been fabricated, installed, or fully completed. Any decision made by the Construction Manager in good faith, shall not give rise to any duty or responsibility of the Construction Manager to: the Developer, any Subcontractor, or their agents, employees, or other persons performing any of the Work. The Construction Manager shall have free access to any or all parts of Work at any time.

40.3. If the District does not use a Construction Manager on this Project, all references to Construction Manager or CM shall be read as District.

41. Inspector, Inspections, and Tests

41.1. Project Inspector

41.1.1. One or more Project Inspector(s), including special Project Inspector(s), as required, will be assigned to the Work by District, in accordance with requirements of title 24, part 1, of the California Code of Regulations, to enforce the building code and monitor compliance with Plans and Specifications for the Project previously approved by the DSA. Duties of Project Inspector(s) are specifically defined in section 4-342 of said part 1 of title 24.

41.1.2. No Work shall be carried on except with the knowledge and under the inspection of the Project Inspector(s). The Project Inspector(s) shall have free access to any or all parts of Work at any time. Developer shall furnish Project Inspector(s) reasonable opportunities for obtaining such information as may be necessary to keep Project Inspector(s) fully informed respecting progress and manner of work and character of materials, including, but not limited to, submission of form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector at least 48 hours in advance of the commencement and completion of construction of each and every aspect of the Work. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>. Inspection of Work shall not relieve Developer from an obligation to fulfill the Contract Documents. Project Inspector(s) and the DSA are authorized to suspend work whenever the Developer and/or its Subcontractor(s) are not complying with the Contract Documents. Any work stoppage by the Project Inspector(s) and/or DSA shall be without liability to the District. Developer shall instruct its Subcontractors and employees accordingly.

41.1.3. If Developer and/or any Subcontractor requests that the Project Inspector(s) perform any inspection off-Site, this shall only be done if it is allowable pursuant to applicable regulations and DSA approval, if the Project Inspector(s) agree to do so, and at the expense of the Developer.

41.2. Tests and Inspections

41.2.1. Tests and Inspections shall comply with title 24, part 1, California Code of Regulations, group 1, article 5, section 4-335, and with the provisions of the Specifications.

41.2.2. The District will select an independent testing laboratory to conduct the tests. Selection of the materials required to be tested shall be by the laboratory or the District's representative and not by the Developer. The Developer shall notify the District's representative a sufficient time in advance of its readiness for required observation or inspection. This notice shall be provided, at a minimum, seventy-two (72) hours prior to the inspection of the material that needs to be tested.

41.2.3. The Developer shall notify the District's representative a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents that must by terms of the Contract Documents be tested so that the District may arrange for the testing of same at the source of supply. This notice shall be provided, at a minimum, seventy-two (72) hours prior to the manufacture of the material that needs to be tested.

41.2.4. Any material shipped by the Developer from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated into and/or onto the Project.

41.2.5. The District will select the testing laboratory and pay for the costs for all tests and inspections. Developer shall reimburse the District for any and all laboratory costs or other testing costs for any materials found to

be not in compliance with the Contract Documents. At the District's discretion, District may elect to deduct laboratory or other testing costs for noncompliant materials from the Guaranteed Maximum Price, and such deduction shall not constitute a withholding.

41.3. Costs for After Hours and/or Off Site Inspections

If the Developer performs Work outside the Inspector's regular working hours, costs of any inspections required outside regular working hours shall be borne by the Developer and may be invoiced to the Developer by the District or the District may deduct those expenses from the next Tenant Improvement Payment.

42. Developer

Developer shall construct and complete, in a good and workmanlike manner, the Work for the Guaranteed Maximum Price including any adjustment(s) to the Guaranteed Maximum Price pursuant to provisions herein regarding changes to the Guaranteed Maximum Price. Except as otherwise noted, Developer shall provide and pay for all labor, materials, equipment, permits (excluding DSA), fees, licenses, facilities, transportation, taxes, bonds and insurance, and services necessary for the proper execution and completion of the Work, except as indicated herein.

42.1. Status of Developer

42.1.1. Developer is and shall at all times be deemed to be an independent contractor and shall be wholly responsible for the manner in which it and its Subcontractors perform the services required of it by the Contract Documents. Nothing herein contained shall be construed as creating the relationship of employer and employee, or principal and agent, between the District, or any of the District's employees or agents, and Developer or any of Developer's Subcontractors, agents or employees. Developer assumes exclusively the responsibility for the acts of its agents and employees as they relate to the services to be provided during the course and scope of their employment. Developer, its Subcontractors, and its agents and employees shall not be entitled to any rights or privileges of District employees. District shall be permitted to monitor the Developer's activities to determine compliance with the terms of the Contract Documents.

42.1.2. As required by law, Developer and all Subcontractors shall be properly licensed and regulated by the Contractors State License Board, 9821 Business Park Drive, Sacramento, California 95827 (Post Office Box 26000, Sacramento, California 95826), <http://www.cslb.ca.gov>.

42.1.3. As required by law, Developer and all Subcontractors shall be properly registered as public works contractors by the Department of Industrial Relations at <https://efiling.dir.ca.gov/PWCR/ActionServlet?action=displayPWCRRegistrationForm> or current URL.

42.1.4. Developer represents that it has no existing interest and will not acquire any interest, direct or indirect, which could conflict in any manner

or degree with the performance of Work required under this Contract and that no person having any such interest shall be employed by Developer.

42.2. Project Inspection Card(s)

Developer shall verify that forms DSA 152 (or most current version applicable at the time the Work is performed) are issued for the Project prior to the commencement of construction.

42.3. Developer's Supervision

42.3.1. During progress of the Work, Developer shall keep on the Premises, and at all other locations where any Work related to the Contract is being performed, an experienced and competent project manager and construction superintendent who are employees of the Developer, to whom the District does not object and at least one of whom shall be fluent in English, written and verbal.

42.3.2. The project manager and construction superintendent shall both speak fluently the predominant language of the Developer's employees.

42.3.3. Before commencing the Work herein, Developer shall give written notice to District of the name of its project manager and construction superintendent. Neither the Developer's project manager nor construction superintendent shall be changed except with prior written notice to District. If the Developer's project manager and/or construction superintendent proves to be unsatisfactory to Developer, or to District, any of the District's employees, agents, the Construction Manager, or the Architect, Developer shall immediately notify District in writing before any change occurs, but no less than two (2) business days prior. Any replacement of the project manager and/or construction superintendent shall be made promptly and must be satisfactory to the District. The Developer's project manager and construction superintendent shall each represent Developer, and all directions given to Developer's project manager and/or construction superintendent shall be as binding as if given to Developer.

42.3.4. Developer shall give efficient supervision to Work, using its best skill and attention. Developer shall carefully study and compare all Contract Documents, Drawings, Specifications, and other instructions and shall at once report to District, Construction Manager, and Architect any error, inconsistency, or omission that Developer or its employees and Subcontractors may discover, in writing, with a copy to District's Project Inspector(s). Developer shall have responsibility for discovery of errors, inconsistencies, or omissions.

42.3.5. All contractors doing work on the Project will provide their workers with identification badges. These badges will be worn by all members of the contractor's staff who are working in a District facility.

42.3.5.1 Badges must be filled out in full and contain the following information:

42.3.5.1.1. Name of contractor

42.3.5.1.2. Name of employee

42.3.5.1.3. Contractor's address and phone number

42.3.5.2 Badges are to be worn when the Developer or his/her employees are on site and must be visible at all times. Contractors must inform their employees that they are required to allow District employees, the Architect, the Construction Manager, the Program Manager, or the Project Inspector to review the information on the badges upon request.

42.3.5.3 Continued failure to display identification badges as required by this policy may result in the individual being removed from the Project or assessment of fines against the contractor.

42.4. Duty to Provide Fit Workers

42.4.1. Developer and Subcontractor(s) shall at all times enforce strict discipline and good order among their employees and shall not employ any unfit person or anyone not skilled in work assigned to that person. It shall be the responsibility of Developer to ensure compliance with this requirement. District may require Developer to permanently remove unfit persons from Project Site.

42.4.2. Any person in the employ of Developer or Subcontractor(s) whom District may deem incompetent or unfit shall be excluded from working on the Project and shall not again be employed on the Project except with the prior written consent of District.

42.4.3. The Developer shall furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work.

42.4.4. If Developer intends to make any change in the name or legal nature of the Developer's entity, Developer shall first notify the District in writing prior to making any contemplated change. The District shall determine in writing if Developer's intended change is permissible while performing the Work.

42.5. Field Office

Developer shall provide on the Work Site a temporary office.

42.6. Purchase of Materials and Equipment

The Developer is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays.

42.7. Documents on Work

42.7.1. Developer shall at all times keep on the Work Site, or at another location as the District may authorize in writing, one legible copy of all Contract Documents, including Addenda and Change Orders, and Titles 19

and 24 of the California Code of Regulations, the specified edition(s) of the Uniform Building Code, all approved Drawings, Plans, Schedules, and Specifications, and all codes and documents referred to in the Specifications, and made part thereof. These documents shall be kept in good order and available to District, Construction Manager, Architect, Architect's representatives, the Project Inspector(s), and all authorities having jurisdiction. Developer shall be acquainted with and comply with the provisions of these titles as they relate to this Project. (See particularly the duties of Contractor, Title 24, Part 1, California Code of Regulations, Section 4-343.) Developer shall also be acquainted with and comply with all California Code of Regulations provisions relating to conditions on this Project, particularly Titles 8 and 17. Developer shall coordinate with Architect and Construction Manager and shall submit its verified report(s) according to the requirements of Title 24.

42.7.2. Daily Job Reports

42.7.2.1 Developer shall maintain, at a minimum, at least one (1) set of Daily Job Reports on the Project. These must be prepared by the Developer's employee(s) who are present on Site, and must include, at a minimum, the following information:

42.7.2.1.1. A brief description of all Work performed on that day.

42.7.2.1.2. A summary of all other pertinent events and/or occurrences on that day.

42.7.2.1.3. The weather conditions on that day.

42.7.2.1.4. A list of all Subcontractor(s) working on that day.

42.7.2.1.5. A list of each Developer employee working on that day and the total hours worked for each employee.

42.7.2.1.6. A complete list of all equipment on Site that day, whether in use or not.

42.7.2.1.7. A complete list of all materials, supplies, and equipment delivered on that day.

42.7.2.1.8. A complete list of all inspections and tests performed on that day.

42.7.2.2 Each day Developer shall provide a copy of the previous day's Daily Job Report to the District or the District's Construction Manager.

42.8. Preservation of Records

Developer shall maintain, and District shall have the right to inspect, Developer's financial records for the Project, including, without limitation, Job Cost Reports for the Project in compliance with the criteria set forth herein. The District shall have

the right to examine and audit all Daily Job Reports or other Project records of Developer's project manager(s), project superintendent(s), and/or project foreperson(s), all certified payroll records and/or related documents including, without limitation, Job Cost Reports, payroll, payment, timekeeping and tracking documents; and as it pertains to change orders, all books, estimates, records, contracts, documents, cost data, subcontract job cost reports, and other data of the Developer, any Subcontractor, and/or supplier, including computations and projections related to estimating, negotiating, pricing, or performing the Work or modification, in order to evaluate the accuracy, completeness, and currency of the cost, manpower, coordination, supervision, or pricing data at no additional cost to the District. These documents may be duplicative and/or be in addition to any documents held in escrow by the District. The Developer shall make available at its office at all reasonable times the materials described in this paragraph for the examination, audit, or reproduction until three (3) years after final payment under this Facilities Lease. Notwithstanding the provisions above, Developer shall provide any records requested by any governmental agency, if available, after the time set forth above.

42.9. Integration of Work

42.9.1. Developer shall do all cutting, fitting, patching, and preparation of Work as required to make its several parts come together properly, to fit it to receive or be received by work of other contractors, and to coordinate tolerances to various pieces of work, showing upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and shall conform them as District and/or Architect may direct.

42.9.2. Developer shall make its own layout of lines and elevations and shall be responsible for the accuracy of both Developer's and Subcontractors' work resulting therefrom.

42.9.3. Developer and all Subcontractors shall take all field dimensions required in performance of the Work, and shall verify all dimensions and conditions on the Site. All dimensions affecting proper fabrication and installation of all Work must be verified prior to fabrication by taking field measurements of the true conditions. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the Work, Developer shall bring such discrepancies to the attention of the District and Architect for adjustment before proceeding with the Work.

42.9.4. All costs caused by noncompliant, defective, or delayed Work shall be borne by Developer, inclusive of repair work.

42.9.5. Developer shall not endanger any work performed by it or anyone else by cutting, excavating, or otherwise altering work and shall not cut or alter work of any other contractor except with consent of District.

42.10. Notifications

42.10.1. Developer shall notify the Architect and Project Inspector, in writing, of the commencement of construction of each and every aspect of the

Work at least 48 hours in advance by submitting form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>.

42.10.2. Developer shall notify the Architect and Project Inspector, in writing, of the completion of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector.

42.11.Obtaining of Permits, Licenses and Registrations

Developer shall secure and pay for any permits (except DSA), licenses, registrations, approvals, and certificates necessary for prosecution of Work, including but not limited to those listed in the Special Conditions, Exhibit D-1, if any, before the date of the commencement of the Work or before the permits, licenses, registrations, approvals and certificates are legally required to continue the Work without interruption. The Developer shall obtain and pay, only when legally required, for all licenses, approvals, registrations, permits, inspections, and inspection certificates required to be obtained from or issued by any authority having jurisdiction over any part of the Work included in the Contract Documents. All final permits, licenses, registrations, approvals and certificates shall be delivered to District before demand is made for final payment. The costs associated with said permits, licenses, registrations, approvals and certificates shall be direct reimbursement items and are not subject to any markup.

42.12.Royalties and Patents

42.12.1. Developer shall obtain and pay, when legally required, all royalties and license fees necessary for prosecution of Work before the earlier of the date of the commencement of the Work or the date the license is legally required to continue the Work without interruption. Developer shall defend suits or claims of infringement of patent, copyright, or other rights and shall hold the District, Construction Manager and the Architect harmless and indemnify them from loss on account thereof except when a particular design, process, or make or model of product is required by the Contract Documents. However, if the Developer has reason to believe that the required design, process, or product is an infringement of a patent or copyright, the Developer shall indemnify and defend the District, Construction Manager and Architect against any loss or damage.

42.12.2. The review by the District, Construction Manager or Architect of any method of construction, invention, appliance, process, article, device; or material of any kind shall be only as to its adequacy for the Work and shall not constitute approve use by the Developer in violation of any patent or other rights of any person or entity.

42.13.Work to Comply With Applicable Laws and Regulations

42.13.1. Developer shall give all notices and comply with the following specific laws, ordinances, rules, and regulations and all other applicable laws, ordinances, rules, and regulations bearing on conduct of Work as indicated and specified, including but not limited to the appropriate statutes and administrative code sections. If Developer observes that Drawings and Specifications are at variance with any applicable laws, ordinances, rules and regulations, or should Developer become aware of the development of conditions not covered by Contract Documents that may result in finished Work being at variance therewith, Developer shall promptly notify District in writing and any changes deemed necessary by District shall be made as provided in this Exhibit D for changes in Work.

42.13.1.1 National Electrical Safety Code, U. S. Department of Commerce

42.13.1.2 National Board of Fire Underwriters' Regulations

42.13.1.3 Uniform Building Code, latest addition, and the California Code of Regulations, title 24, and other amendments

42.13.1.4 Manual of Accident Prevention in Construction, latest edition, published by A.G.C. of America

42.13.1.5 Industrial Accident Commission's Safety Orders, State of California

42.13.1.6 Regulations of the State Fire Marshall (title 19, California Code of Regulations) and Pertinent Local Fire Safety Codes

42.13.1.7 Americans with Disabilities Act

42.13.1.8 Education Code of the State of California

42.13.1.9 Government Code of the State of California

42.13.1.10 Labor Code of the State of California, division 2, part 7, Public Works and Public Agencies

42.13.1.11 Public Contract Code of the State of California

42.13.1.12 California Art Preservation Act

42.13.1.13 U. S. Copyright Act

42.13.1.14 U. S. Visual Artists Rights Act

42.13.2. Developer shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code section 21000 et seq.).

42.13.3. If Developer performs any Work that it knew, or through exercise of reasonable care should have known, to be contrary to any

applicable laws, ordinance, rules, or regulations, Developer shall bear all costs arising therefrom and arising from the correction of said Work.

42.13.4. Where Specifications or Drawings state that materials, processes, or procedures must be approved by the DSA, State Fire Marshall, or other body or agency, Developer shall use its best efforts to satisfy the requirements of such bodies or agencies applicable at the time the Work is performed, and as determined by those bodies or agencies.

42.14. Safety/Protection of Persons and Property

42.14.1. The Developer will be solely and completely responsible for conditions of the Work Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours.

42.14.2. The wearing of hard hats will be mandatory at all times for all personnel on Site. Developer shall supply sufficient hard hats to properly equip all employees and visitors.

42.14.3. Any construction review of the Developer's performance is not intended to include review of the adequacy of the Developer's safety measures in, on, or near the Work Site.

42.14.4. Implementation and maintenance of safety programs shall be the sole responsibility of the Developer.

42.14.5. The Developer shall furnish to the District a copy of the Developer's safety plan within the time frame indicated in the Contract Documents and specifically adapted for the Project.

42.14.6. Developer shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of the Contract Documents and shall take all necessary measures and be responsible for the proper care and completion and final acceptance by District. All Work shall be solely at Developer's risk.

42.14.7. Developer shall take, and require Subcontractors to take, all necessary precautions for safety of workers on the Project and shall comply with all applicable federal, state, local, and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. Developer shall furnish, erect, and properly maintain at all times, all necessary safety devices, safeguards, construction canopies, signs, nets, barriers, lights, and watchmen for protection of workers and the public and shall post danger signs warning against hazards created by such features in the course of construction.

42.14.8. Hazards Control –Developer shall store volatile wastes in approved covered metal containers and remove them from the Site daily. Developer shall prevent accumulation of wastes that create hazardous conditions. Developer shall provide adequate ventilation during use of volatile or noxious substances.

42.14.9. Developer shall designate a responsible member of its organization on the Project, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety, and health of workers. Name and position of person so designated shall be reported to District by Developer.

42.14.10. Developer shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, Developer shall correct such violation promptly.

42.14.11. Developer shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

42.14.12. In an emergency affecting safety of life or of work or of adjoining property, Developer, without special instruction or authorization, shall act, at its discretion, to prevent such threatened loss or injury. Any compensation claimed by Developer on account of emergency work shall be determined by agreement.

42.14.13. All salvage materials will become the property of the Developer and shall be removed from the Site unless otherwise called for in the Contract Documents. However, the District reserves the right to designate certain items of value that shall be turned over to the District unless otherwise directed by District.

42.14.14. All connections to public utilities and/or existing on-site services shall be made and maintained in such a manner as to not interfere with the continuing use of same by the District during the entire progress of the Work.

42.14.15. Developer shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions, such as extreme heat, cold, rain, snow, dry winds, flooding, or dampness.

42.14.16. The Developer shall protect and preserve the Work from all damage or accident, providing any temporary roofs, window and door coverings, boxings, or other construction as required by the Architect. The Developer shall be responsible for existing structures, walks, roads, trees, landscaping, and/or improvements in working areas; and shall provide adequate protection therefor. If temporary removal is necessary of any of the above items, or damage occurs due to the Work, the Developer shall replace same at his expense with same kind, quality, and size of Work or item damaged. This shall include any adjoining property of the District and others.

42.14.17. Developer shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property, and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations.

42.14.18. Developer shall confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits, or directions of Architect, and shall not interfere with the Work or unreasonably encumber Premises or overload any structure with materials. Developer shall enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking, and require that all workers comply with all regulations while on Project Site.

42.14.19. Developer, Developer's employees, Subcontractors, Subcontractors' employees, or any person associated with the Work shall conduct themselves in a manner appropriate for a school site. No verbal or physical contact with neighbors, students, and faculty, profanity, or inappropriate attire or behavior will be permitted. District may require Developer to permanently remove non-complying persons from Project Site.

42.14.20. Developer shall take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed, Developer shall have a civil engineer, registered as a professional engineer in California, replace them at no cost to District.

42.14.21. In the event that the Developer enters into any agreement with owners of any adjacent property to enter upon the adjacent property for the purpose of performing the Work, Developer shall fully indemnify, defend, and hold harmless each person, entity, firm, or agency that owns or has any interest in adjacent property. The form and content of the agreement of indemnification shall be approved by the District prior to the commencement of any Work on or about the adjacent property. The Developer shall also indemnify the District as provided in the indemnification provision herein. These provisions shall be in addition to any other requirements of the owners of the adjacent property.

42.15. General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities ("General Permit")

42.15.1. Developer acknowledges that all California school districts are obligated to develop and implement the following requirements for the discharge of storm water to surface waters from its construction and land disturbance activities (storm water requirements), without limitation:

42.15.1.1A Municipal Separate Storm Sewer System (MS4). An MS4 is a system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

42.15.1.2A Storm Water Pollution Prevention Plan ("SWPPP") that contains specific best management practices ("BMPs") and establishes numeric effluent limitations at:

42.15.1.2.1. Sites where the District engages in maintenance (e.g., fueling, cleaning, repairing) or transportation activities.

42.15.1.2.2. Construction sites where:

42.15.1.2.2.1. One (1) or more acres of soil will be disturbed, or

42.15.1.2.2.2. The Project is part of a larger common plan of development that disturbs more than one (1) acre of soil.

42.15.2. Developer shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

42.15.3. At no additional cost to the District, Developer shall provide a Qualified Storm Water Practitioner who shall be onsite and implement and monitor any and all SWPPP requirements applicable to the Project, including but not limited to:

42.15.3.1 At least forty eight (48) hours prior to a forecasted rain event, implementing the Rain Event Action Plan (REAP) for any rain event requiring implementation of the REAP, including any erosion and sediment control measures needed to protect all exposed portions of the site; and

42.15.3.2 Monitoring any Numeric Action Levels (NALs), if applicable.

42.16. Working Evenings and Weekends

Developer may be required to work increased hours, evenings, and/or weekends at no additional cost to the District. Developer shall give the District seventy-two (72) hours' notice prior to performing any evening and/or weekend work. Developer shall perform all evening and/or weekend work in compliance with all applicable rules, regulations, laws, and local ordinances including, without limitation, all noise and light limitations. Developer shall reimburse the District for any increased or additional Inspector charges as a result of the Developer's increased hours, or evening and/or weekend work.

42.17. Cleaning Up

42.17.1. The Developer shall provide all services, labor, materials, and equipment necessary for protecting and securing the Work, all school occupants, furnishings, equipment, and building structure from damage until its completion and final acceptance by District. Dust barriers shall be provided to isolate dust and dirt from construction operations. At completion of the Work and portions thereof, Developer shall clean to the original state any areas beyond the Work area that become dust laden as a result of the Work. The Developer must erect the necessary warning signs and barricades to ensure the safety of all school occupants. The Developer at all times must maintain good housekeeping practices to reduce the risk of fire damage and must make a fire extinguisher, fire blanket, and/or fire watch, as applicable, available at each location where cutting, braising, soldering, and/or welding is being performed or where there is an increased risk of fire.

42.17.2. Developer at all times shall keep Premises, including property immediately adjacent thereto, free from debris such as waste, rubbish (including personal rubbish of workers, e.g., food wrappers, etc.), and excess materials and equipment caused by the Work. Developer shall not leave debris under, in, or about the Premises (or surrounding property or neighborhood), but shall promptly remove same from the Premises on a daily basis. If Developer fails to clean up, District may do so and the cost thereof shall be charged to Developer. If the Contract calls for Work on an existing facility, Developer shall also perform specific clean-up on or about the Premises upon request by the District as it deems necessary for the continuing education process. Developer shall comply with all related provisions of the Specifications.

42.17.3. If the Construction Manager, Architect, or District observes the accumulation of trash and debris, the District will give the Developer a 24-hour written notice to mitigate the condition.

42.17.4. Should the Developer fail to perform the required clean-up, or should the clean-up be deemed unsatisfactory by the District, the District will then perform the clean-up. All cost associated with the clean-up work (including all travel, payroll burden, and costs for supervision) will be deducted from the Guaranteed Maximum Price, or District may withhold those amounts from payment(s) to Developer.

43.Subcontractors

43.1. Developer shall provide the District with information for all of Developer's Subcontracts and Subcontractors as indicated in the Developer's Submittals and Schedules Section herein.

43.2. No contractual relationship exists between the District and any Subcontractor, supplier, or sub-subcontractor by reason of the Contract Documents.

43.3. Developer agrees to bind every Subcontractor by terms of the Contract Documents as far as those terms that are applicable to Subcontractor's work including, without limitation, all labor, wage & hour, apprentice and related provisions and requirements. If Developer subcontracts any part of the Work called for by the Contract Documents, Developer shall be as fully responsible to District for acts and omissions of any Subcontractor and of persons either directly or indirectly employed by any Subcontractor, including Subcontractor caused Project delays, as it is for acts and omissions of persons directly employed by Developer. The divisions or sections of the Specifications and/or the arrangements of the drawings are not intended to control the Developer in dividing the Work among Subcontractors or limit the work performed by any trade.

43.4. District's consent to, or approval of, or failure to object to, any Subcontractor under the Contract Documents shall not in any way relieve Developer of any obligations under the Contract Documents and no such consent shall be deemed to waive any provisions of the Contract Documents.

43.5. Developer is directed to familiarize itself with sections 1720 through 1861 of the Labor Code of the State of California, as regards the payment of prevailing wages and related issues, and to comply with all applicable requirements therein

including, without limitation, section 1775 and the Developer's and Subcontractors' obligations and liability for violations of prevailing wage law and other applicable laws.

43.6. Developer shall be responsible for the coordination of the trades, Subcontractors, sub-subcontractors, and material or equipment suppliers working on the Project.

43.6.1. If the Contract is valued at \$1 million or more and plans to use state bond funds, then Developer is responsible for ensuring that first-tier Subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43, and/or C-46 licenses, are prequalified by the District to work on the Project pursuant to Public Contract Code section 20111.6.

43.6.2. Developer is responsible for ensuring that all Subcontractors are properly registered as public works contractors by the Department of Industrial Relations.

43.7. Developer is solely responsible for settling any differences between the Developer and its Subcontractor(s) or between Subcontractors.

43.8. Developer must include in all of its subcontracts the assignment provisions indicated in the Termination section of these Construction Provisions.

44. Other Contracts/Contractors

44.1. District reserves the right to let other contracts, and/or to perform work with its own forces, in connection with the Project. Developer shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly coordinate and connect Developer's Work with the work of other contractors.

44.2. Developer shall protect the work of any other contractor that Developer encounters while working on the Project.

44.3. If any part of Developer's Work depends for proper execution or results upon work of District or any other contractor, the Developer shall visually inspect, and with reasonable effort, physically inspect all accessible portions of District's or any other contractor's work and, before proceeding with its Work, promptly report to the District in writing any defects in District's or any other contractor's work that render Developer's Work unsuitable for proper execution and results. Developer shall be held accountable for damages to District for District's or any other contractor's work that Developer failed to inspect or should have inspected. Developer's failure to inspect and report shall constitute Developer's acceptance of all District's or any other contractor's work as fit and proper for reception of Developer's Work, except as to defects that may develop in District's or any other contractor's work after execution of Developer's Work and not caused by execution of Developer's Work.

44.4. To ensure proper execution of its subsequent Work, Developer shall measure and inspect Work already in place and shall at once report to the District in writing any discrepancy between that executed Work and the Contract Documents.

44.5. Developer shall ascertain to its own satisfaction the scope of the Project and nature of District's or any other contracts that have been or may be awarded by District in prosecution of the Project to the end that Developer may perform under the Contract in light of the other contracts, if any.

44.6. Nothing herein contained shall be interpreted as granting to Developer exclusive occupancy of the Site, the Premises, or of the Project. Developer shall not cause any unnecessary hindrance or delay to the use and/or school operation(s) of the Premises and/or to District or any other contractor working on the Project. If simultaneous execution of any contract or school operation is likely to cause interference with performance of Developer's obligations under the Contract Documents, Developer shall coordinate with those contractor(s), person(s), and/or entity(s) and shall notify the District of the resolution.

45. Drawings and Specifications

45.1. A complete list of all Drawings that form a part of the Contract Documents are to be found as an index on the Drawings themselves, and/or may be provided to the Developer and/or in the Table of Contents.

45.2. Materials or Work described in words that so applied have a well-known technical or trade meaning shall be deemed to refer to recognized standards, unless noted otherwise.

45.3. Trade Name or Trade Term

It is not the intention of the Contract Documents to go into detailed descriptions of any materials and/or methods commonly known to the trade under "trade name" or "trade term." The mere mention or notation of "trade name" or "trade term" shall be considered a sufficient notice to Developer that it will be required to complete the work so named, complete, finished, and operable, with all its appurtenances, according to the best practices of the trade.

45.4. The naming of any material and/or equipment shall mean furnishing and installing of same, including all incidental and accessory items thereto and/or labor therefor, as per best practices of the trade(s) involved, unless specifically noted otherwise.

45.5. Contract Documents are complementary, and what is called for by one shall be binding as if called for by all. As such, Drawings and Specifications are intended to be fully cooperative and to agree. However, if Developer observes that Drawings and Specifications are in conflict with the Contract Documents, Developer shall promptly notify District and Architect in writing, and any necessary changes shall be made as provided in the Contract Documents.

45.6. Figured dimensions shall be followed in preference to scaled dimensions, and the Developer shall make all additional measurements necessary for the work and shall be responsible for their accuracy. Before ordering any material or doing any work, each Developer shall verify all measurements at the building and shall be responsible for the correctness of same.

45.7. Should any question arise concerning the intent or meaning of the Contract Documents, including the Plans and Specifications, the question shall be submitted to

the District for interpretation. If a conflict exists in the Contract Documents, these Construction Provisions shall control over the Facilities Lease, which shall control over the Site Lease, which shall control over Division 1 Documents, which shall control over Division 2 through Division 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In no case shall a document calling for lower quality and/or quantity of material or workmanship control. However, in the case of discrepancy or ambiguity solely between and among the Drawings and Specifications, the discrepancy or ambiguity shall be resolved in favor of the interpretation that will provide District with the functionally complete and operable Project described in the Drawings and Specifications.

45.8. Drawings and Specifications are intended to comply with all laws, ordinances, rules, and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, the laws, ordinances, rules, and regulations shall be considered as a part of the Contract Documents within the limits specified.

45.9. As required by Section 4-317(c), Part 1, Title 24, CCR: "Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA-approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work."

45.10. Ownership of Drawings

All copies of Plans, Drawings, Designs, Specifications, and copies of other incidental architectural and engineering work, or copies of other Contract Documents furnished by District, are the property of District. They are not to be used by Developer in other work and, with the exception of signed sets of Contract Documents, are to be returned to District on request at completion of Work or may be used by District as it may require without any additional costs to District. Neither the Developer nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. District hereby grants the Developer, Subcontractors, sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings prepared for the Project in the execution of their Work under the Contract Documents.

46. Developer's Submittals and Schedules

Developer's submittals shall comply with the provisions and requirements of the Specifications including, without limitation Submittals.

46.1. Schedule of Work, Schedule of Submittals, and Schedule of Values.

46.1.1. The Developer shall comply with the construction schedule attached to the Facilities Lease as Exhibit F ("Construction Schedule"). [To be attached when available.]

46.1.2. Developer must provide all schedules both in hard copy and electronically, in a format (e.g. Microsoft Project or Primavera) approved in advance by the District.

46.1.3. The District will review the schedules submitted and the Developer shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

46.1.4. The District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

46.1.5. All submittals and schedules must be approved by the District before Developer can rely on them as a basis for payment.

46.1.6. Within TEN (10) calendar days after the date of the Notice to Proceed (unless otherwise specified in the Specifications), the Developer shall prepare and submit to the District for review, in a form supported by sufficient data to substantiate its accuracy as the District may require:

46.1.6.1 Preliminary Schedule

A preliminary schedule of construction indicating the starting and completion dates of the various stages of the Work, including any information and following any form as may be specified in the Specifications. Once approved by District, this shall become the Construction Schedule. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of each critical path task as well as all Contract milestones and each milestone's completion date(s) as may be required by the District.

46.1.6.2 Preliminary Schedule of Values

A preliminary schedule of values for all of the Work, which must include quantities and prices of items aggregating the Contract Price and must subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Unless the Special Conditions contain different limits, this preliminary schedule of values shall include, at a minimum, the following information and the following structure:

46.1.6.2.1. Divided into at least the following categories:

46.1.6.2.1.1. Overhead and profit

46.1.6.2.1.2. Supervision

46.1.6.2.1.3. General conditions

46.1.6.2.1.4. Layout

46.1.6.2.1.5. Mobilization

46.1.6.2.1.6. Submittals

46.1.6.2.1.7. Bonds and insurance

46.1.6.2.1.8. Close-out/Certification documentation

46.1.6.2.1.9. Demolition

46.1.6.2.1.10. Installation

46.1.6.2.1.11. Rough-in

46.1.6.2.1.12. Finishes

46.1.6.2.1.13. Testing

46.1.6.2.1.14. Punch list and acceptance

46.1.6.2.2. And also divided by each of the following areas:

46.1.6.2.2.1. Site work

46.1.6.2.2.2. By each building

46.1.6.2.2.3. By each floor

46.1.6.2.3. The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

46.1.6.2.3.1. Mobilization and layout combined to equal not more than 1%.

46.1.6.2.3.2. Submittals, samples and shop drawings combined to equal not more than 3%.

46.1.6.2.3.3. Bonds and insurance combined to equal not more than 2%.

46.1.6.2.4. Closeout documentation shall have a value in the preliminary schedule of not less than 5%.

46.1.6.2.5. Notwithstanding any provision of the Contract Documents to the contrary, payment of the Developer's overhead, supervision, general conditions costs, and profit, as reflected in the Cost Breakdown, shall be paid based on percentage complete, with the disbursement of Progress Payments and the Final Payment.

46.1.6.2.6. Developer shall certify that the preliminary schedule of values as submitted to the District is accurate and reflects the costs as developed in preparing Developer's bid. The preliminary schedule of values shall be subject to the District's review and approval of the form and content thereof. In the event that the District objects to any portion of the preliminary schedule of values, the District shall notify the Developer, in writing, of the District's objection(s) to the preliminary schedule of values. Within five (5) calendar days of the date of the District's written objection(s), Developer shall submit a revised preliminary schedule of values to the District for review and approval. The foregoing procedure for the preparation, review and approval of the preliminary schedule of values shall continue until the District has approved the entirety of the preliminary schedule of values.

46.1.6.2.7. Once the preliminary schedule of values is approved by the District, this shall become the Schedule of Values. The Schedule of Values shall not be thereafter modified or amended by the Developer without the prior consent and approval of the District, which may be granted or withheld in the sole discretion of the District.

46.1.6.3 Schedule of Values

The Developer shall provide for District review and approval prior to commencement of the Work a schedule of values for all of the Work, which includes quantities and prices of items aggregating the Guaranteed Maximum Price and subdivided into component parts as per specifications. The Schedule of Values shall not be modified or amended by the Developer without the prior consent and approval of the District, which may be granted or withheld in the sole discretion of the District. The District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

46.1.6.4 Preliminary Schedule of Submittals

A preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals. Once approved by District, this shall become the Submittal Schedule. All submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those submittals shall be forwarded to the District so as not to delay the Construction Schedule. Upon request by the District, Developer shall provide an electronic copy of all submittals to the District. All submittals shall be submitted no later than 90 days after the Notice to Proceed.

46.1.6.5 Safety Plan

Developer's Safety Plan specifically adapted for the Project shall comply with the following requirements:

46.1.6.5.1. All applicable requirements of California Division of Occupational Safety and Health ("Cal/OSHA") and/or of the United States Occupational Safety and Health Administration ("OSHA").

46.1.6.5.2. All provisions regarding Project safety, including all applicable provisions in these Construction Provisions.

46.1.6.5.3. Developer's Safety Plan shall be in English and in the language(s) of the Developer's and its Subcontractors' employees.

46.1.6.6 Complete Subcontractor List

The name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

46.2. Monthly Progress Schedule(s)

46.2.1. Developer shall provide Monthly Progress Schedule(s) to the District. A Monthly Progress Schedule shall update the approved Construction Schedule or the last Monthly Progress Schedule, showing all work completed and to be completed. The monthly Progress Schedule shall be sent as noted below and, if also requested by District, within the timeframe requested by the District and shall be in a format acceptable to the District and contain a written narrative of the progress of work that month and any changes, delays, or events that may affect the work. The process for District approval of the Monthly Progress Schedule shall be the same as the process for approval of the Construction Schedule.

46.2.2. Developer shall submit Monthly Progress Schedule(s) with all payment applications.

46.2.3. Developer must provide all schedules both in hard copy and electronically, in a format (e.g., Microsoft Project or Primavera) approved in advance by the District.

46.2.4. District will review the schedules submitted and Developer shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

46.2.5. District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

46.2.6. All submittals and schedules must be approved by the District before Developer can rely on them as a basis for payment.

46.3. Material Safety Data Sheets (MSDS)

Developer is required to ensure Material Safety Data Sheets are available in a readily accessible place at the Work Site for any material requiring a Material Safety Data Sheet per the federal "Hazard Communication" standard, or employees' "right to know" law. The Developer is also required to ensure proper labeling on substances brought onto the job site and that any person working with the material or within the general area of the material is informed of the hazards of the substance and follows proper handling and protection procedures. Two additional copies of the Material Safety Data Sheets shall also be submitted directly to the District.

47. Site Access, Conditions, And Requirements

47.1. Site Investigation

Developer has made a careful investigation of the Site and is familiar with the requirements of the Contract Documents and has accepted the readily observable, existing conditions of the Site.

47.2. Soils Investigation Report

When a soils investigation report obtained from test holes at Site or for the Project is available, that report may be made available to the Developer but shall not be a part of this Contract but shall not alleviate or excuse Developer's obligation to perform its own investigation. Any information obtained from that report or any information given on Drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only, is not guaranteed, does not form a part of this Contract, and Developer may not rely thereon. Developer acknowledges that it has made a visual examination of the Site and has made whatever tests Developer deems appropriate to determine underground condition of soil.

47.3. Access to Work

District and its representatives shall at all times have access to Work wherever it is in preparation or progress, including storage and fabrication. Developer shall provide safe and proper facilities for such access so that District's representatives may perform their functions.

47.4. Layout and Field Engineering

47.4.1. All field engineering required for layout of this Work and establishing grades for earthwork operations shall be furnished by Developer at its expense. This Work shall be done by a qualified, California-registered civil engineer approved in writing by District and Architect. Any required Record and/or As-Built Drawings of Site development shall be prepared by the approved civil engineer.

47.4.2. The Developer shall be responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the Site and for having satisfied itself as to the conditions under which the Work is to be performed. District shall not be liable for any claim for allowances because of Developer's error or negligence in acquainting itself with the conditions at the Site.

47.4.3. Developer shall protect and preserve established benchmarks and monuments and shall make no changes in locations without the prior written approval of District. Developer shall replace any benchmarks or monuments that are lost or destroyed subsequent to proper notification of District and with District's approval.

47.5. Utilities

Utilities shall be provided as indicated in the Specifications.

47.6. Sanitary Facilities

Sanitary facilities shall be provided as indicated in the Specifications.

47.7. Surveys

Developer shall provide surveys done by a California-licensed civil engineer surveyor to determine locations of construction, grading, and site work as required to perform the Work.

47.8. Regional Notification Center

The Developer, except in an emergency, shall contact the appropriate regional notification center at least two (2) days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and/or carried out by the Developer unless an inquiry identification number has been assigned to the Developer or any Subcontractor and the Developer has given the District the identification number. Any damages arising from Developer's failure to make appropriate notification shall be at the sole risk and expense of the Developer. Any delays caused by failure to make appropriate notification shall be at the sole risk of the Developer and shall not be considered for an extension of the Contract Time.

47.9. Existing Utility Lines

47.9.1. Pursuant to Government Code section 4215, District assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction Site at the time of commencement of construction under the Contract Documents with respect to any such utility facilities that are not identified in the Plans and Specifications. Developer shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of District or the owner of a utility to provide for removal or relocation of such utility facilities.

47.9.2. Locations of existing utilities provided by District shall not be considered exact, but approximate within a reasonable margin and shall not relieve Developer of its responsibilities to exercise reasonable care and to pay all costs of repair due to Developer's failure to do so. District shall compensate Developer for the costs of locating, repairing damage not due to the failure of Developer to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during such work.

47.9.3. No provision herein shall be construed to preclude assessment against Developer for any other delays in completion of the Work. Nothing in this Article shall be deemed to require District to indicate the presence of existing service laterals, appurtenances, or other utility lines, within the exception of main or trunk utility lines. Whenever the presence of these utilities on the Site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter junction boxes, on or adjacent to the Site of the construction.

47.9.4. If Developer, while performing Work under this Contract, discovers utility facilities not identified by District in Contract Plans and Specifications, Developer shall immediately notify the District and the utility in writing. In the event Developer fails to immediately provide notice and subsequently causes damage to the utility facilities, the cost of repair for damage to above-mentioned visible facilities shall be borne by the Developer.

47.10. Notification

Developer understands, acknowledges and agrees that the purpose for prompt notification to the District pursuant to these provisions is to allow the District to investigate the condition(s) so that the District shall have the opportunity to decide how the District desires to proceed as a result of the condition(s). Accordingly, failure of Developer to promptly notify the District in writing, pursuant to these provisions, shall constitute Developer's waiver of any claim for damages or delay incurred as a result of the condition(s).

47.11. Hazardous Materials

Developer shall comply with all provisions and requirements of the Contract Documents related to hazardous materials including, without limitation, Hazardous Materials Procedures and Requirements.

47.12.No Signs

Neither the Developer nor any other person or entity shall display any signs not required by law or the Contract Documents at the Site, fences, trailers, offices, or elsewhere on the Site without specific prior written approval of the District.

48.Trenches

48.1. Trenches Greater Than Five Feet

Pursuant to Labor Code section 6705, if the Guaranteed Maximum Price exceeds \$25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Developer shall, in advance of excavation, promptly submit to the District and/or a registered civil or structural engineer employed by the District or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

48.2. Excavation Safety

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the District or by the person to whom authority to accept has been delegated by the District.

48.3. No Tort Liability of District

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.

48.4. No Excavation without Permits

The Developer shall not commence any excavation Work until it has secured all necessary permits including the required CalOSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

48.5. Discovery of Hazardous Waste and/or Unusual Conditions

48.5.1. Pursuant to Public Contract Code section 7104, if the Work involves digging trenches or other excavations that extend deeper than four feet below the Surface, the Developer shall promptly, and before the following conditions are disturbed, notify the District, in writing, of any:

48.5.1.1 Material that the Developer believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

48.5.1.2 Subsurface or latent physical conditions at the Site differing from those indicated.

48.5.1.3 Unknown physical conditions at the Project Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

48.5.2. The District shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Developer's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order under the procedures described herein.

48.5.3. In the event that a dispute arises between District and the Developer whether the conditions materially differ or cause a decrease or increase in the Developer's cost of, or time required for, performance of any part of the Work, the Developer shall not be excused from any scheduled completion date provided for by the Contract Documents, but shall proceed with all work to be performed under the Contract Documents. The Developer shall retain any and all rights provided either by the Contract Documents or by law that pertain to the resolution of disputes and protests.

49. Insurance and Bonds

49.1. Developer's Insurance

The Developer shall comply with the insurance requirements as indicated in the Facilities Lease.

49.2. Contract Security – Bonds

49.2.1. Developer shall furnish two surety bonds issued by a California admitted surety insurer as follows:

49.2.1.1 Performance Bond

A bond in an amount at least equal to one hundred percent (100%) of Guaranteed Maximum Price as security for faithful performance of the Contract Documents.

49.2.1.2 Payment Bond

A bond in an amount at least equal to one hundred percent (100%) of the Guaranteed Maximum Price as security for payment of persons performing labor and/or furnishing materials in connection with this Contract.

49.2.2. Cost of bonds shall be included in the Guaranteed Maximum Price.

49.2.3. All bonds related to this Project shall be in the forms set forth in these Contract Documents and shall comply with all requirements of the Contract Documents, including, without limitation, the bond forms.

50. Warranty/Guarantee/Indemnity

50.1. Warranty/Guarantee

50.1.1. The Developer shall obtain and preserve for the benefit of the District, manufacturer's warranties on materials, fixtures, and equipment incorporated into the Work.

50.1.2. In addition to guarantees and warranties required elsewhere, Developer shall, and hereby does guarantee and warrant all Work furnished on the job against all defects for a period of ONE (1) year after the later of the following dates, unless a longer period is provided for in the Contract Documents:

50.1.2.1 The acceptance by the District, or its agent, of the Work, subject to these General Conditions, or

50.1.2.2 The date that commissioning for the Project, if any, was completed.

50.1.3. If any work is not in compliance with the Drawings and Specifications, Developer shall repair or replace any and all of that Work, together with any other Work that may be displaced in so doing, that may prove defective in workmanship and/or materials within a ONE (1) year period from date of completion as defined above, unless a longer period is provided for in the Contract Documents, without expense whatsoever to District.

50.1.4. In the event of failure of Developer and/or Surety to commence and pursue with diligence said replacements or repairs within ten (10) days after being notified in writing, Developer and Surety hereby acknowledge and agree that District is authorized to proceed to have defects repaired and made good at expense of Developer and/or Surety who hereby agree to pay costs and charges therefore immediately on demand.

50.1.5. If any work is not in compliance with the Drawings and Specifications and if in the opinion of District said defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to District or to prevent interruption of operations of District, District will attempt to give the notice required above. If Developer or Surety cannot be contacted or neither complies with District's request for correction within a reasonable time as determined by District, District may, notwithstanding the above provision, proceed to make any and all corrections and/or provide attentions the District believes are necessary. The costs of correction or attention shall be charged against Developer and Surety of the guarantees or warranties provided in this Article or elsewhere in this Agreement.

50.1.6. The above provisions do not in any way limit the guarantees or warranties on any items for which a longer guarantee or warranty is specified or on any items for which a manufacturer gives a guarantee or warranty for a longer period. Developer shall furnish to District all appropriate guarantee or warranty certificates as indicated in the Specifications or upon request by District.

50.1.7. Nothing herein shall limit any other rights or remedies available to District.

50.2. Indemnity

Developer shall indemnify the District as indicated in the Facilities Lease.

51. Time

51.1. Notice to Proceed

51.1.1. District may issue a Notice to Proceed within ninety (90) days from the date of the Notice of Award. Once Developer has received the Notice to Proceed, Developer shall complete the Work within the period of time indicated in the Contract Documents.

51.1.2. In the event that the District desires to postpone issuing the Notice to Proceed beyond ninety (90) days from the date of the Notice of Award, it is expressly understood that with reasonable notice to the Developer, the District may postpone issuing the Notice to Proceed. It is further expressly understood by Developer that Developer shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed.

51.1.3. If the Developer believes that a postponement of issuance of the Notice to Proceed will cause a hardship to Developer, Developer may terminate the Contract. Developer's termination due to a postponement shall be by written notice to District within ten (10) days after receipt by Developer of District's notice of postponement. It is further understood by Developer that in the event that Developer terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Developer for the Work that Developer had performed at the time of notification of postponement.

51.2. Computation of Time / Adverse Weather

51.2.1. The Developer will only be allowed a time extension for Adverse Weather conditions if requested by Developer in compliance with the time extension request procedures and only if all of the following conditions are met:

51.2.1.1 The weather conditions constitute Adverse Weather, as defined herein.

51.2.1.2 Developer can verify that the Adverse Weather caused delays in excess of five (5) hours of the indicated labor required to complete the scheduled tasks of Work on the day affected by the Adverse Weather.

51.2.1.3 The Developer's crew is dismissed as a result of the Adverse Weather;

51.2.1.4 Said delay adversely affect the critical path in the Construction Schedule; and

51.2.1.5 The number of days of delay for the month the following parameters:

January	6	July	0
February	5	August	0
March	5	September	1
April	4	October	1
May	1	November	3
June	0	December	5

51.2.2. If the aforementioned conditions are met, a non-compensable day-for-day extension will only be allowed for those days in excess of those indicated herein.

51.2.3. The Developer shall work seven (7) days per week, if necessary, irrespective of inclement weather, to maintain access and the Construction Schedule, and to protect the Work under construction from the effects of Adverse Weather, all at no further cost to the District.

51.2.4. The Contract Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located.

51.3. Hours of Work

51.3.1. Sufficient Forces

Developer and Subcontractors shall continuously furnish sufficient and competent work forces with the required levels of familiarity with the Project and skill, training and experience to ensure the prosecution of the Work in accordance with the Construction Schedule.

51.3.2. Performance During Working Hours

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the District and approval of any required governmental agencies.

51.3.3. No Work during State Testing

Developer shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State or Federally-required tests. The District or District's Representative will provide Developer with a schedule of test dates concurrent with the District's

issuance of the Notice to Proceed, or as soon as test dates are made available to the District.

51.4. Progress and Completion

51.4.1. Time of the Essence

Time limits stated in the Contract Documents are of the essence to the Contract Documents. By executing the Facilities Lease, the Developer confirms that the Contract Time is a reasonable period for performing the Work.

51.4.2. No Commencement Without Insurance or Bonds

The Developer shall not commence operations on the Project or elsewhere prior to the effective date of insurance and bonds. The date of commencement of the Work shall not be changed by the effective date of such insurance or bonds. If Developer commences Work without insurance and bonds, all Work is performed at Developer's peril and shall not be compensable until and unless Developer secures bonds and insurance pursuant to the terms of the Contract Documents and subject to District claim for damages.

51.5. Schedule

Developer shall provide to District, Construction Manager, and Architect a schedule in conformance with the Contract Documents and as required in these Construction Provisions.

51.6. Expeditious Completion

The Developer shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time.

52. Extensions of Time – Liquidated Damages

52.1. Liquidated Damages

Developer and District hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the District will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Developer shall pay to District as fixed and liquidated damages, and not as a penalty, the amount set forth in the Facilities Lease for each calendar day of delay in Completion. Developer and its Surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

52.2. Excusable Delay

52.2.1. Developer shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault of Developer or its

Subcontractors, including acts of God as defined in Public Contract Code section 7105, acts of enemy, epidemics, and quarantine restrictions. Developer shall, within five (5) calendar days of beginning of any delay, notify District in writing of causes of delay including documentation and facts explaining the delay and the direct correlation between the cause and effect. District shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Developer has timely submitted the Construction Schedule as required herein.

52.2.2. Developer shall notify the District pursuant to the claims provisions in these Construction Provisions of any anticipated delay and its cause. Following submission of a claim, the District may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

52.2.3. In the event the Developer requests an extension of Contract Time for unavoidable delay as set forth in subparagraph 16.2.1, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work. When requesting time, requests must be submitted with full justification and documentation. If the Developer fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any claim for delay must include the following information as support, without limitation:

52.2.3.1 The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

52.2.3.2 Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. In particular, Developer must show an actual impact to the schedule, after making a good faith effort to mitigate the delay by rescheduling the work, by providing an analysis of the schedule ("Schedule Analysis"). Such Schedule Analysis shall describe in detail the cause and effect of the delay and the impact on the critical dates in the Project schedule. (This information must be provided for any portion of any delay of seven (7) days or more.)

52.2.3.3 A recovery schedule must be submitted within twenty (20) calendar days of written notification to the District of causes of delay.

52.3. No Additional Compensation for Delays within Developer's Control

52.3.1. Developer is aware that governmental agencies and utilities, including, without limitation, the Division of the State Architect, the Department of General Services, gas companies, electrical utility companies,

water districts, and other agencies may have to approve Developer-prepared drawings or approve a proposed installation. Accordingly, Developer has included in the Guaranteed Maximum Price, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies, including without limitation delays due to California Environmental Quality Act ("CEQA") compliance. Thus, Developer is not entitled to make a claim for damages for delays arising from the review of Developer's drawings.

52.3.1.1 Developer shall only be entitled to compensation for delay when all of the following conditions are met:

52.3.1.1.1. The District is responsible for the delay.

52.3.1.1.2. The delay is unreasonable under the circumstances involved.

52.3.1.1.3. The delay was not within the contemplation of District and Developer; and

52.3.1.1.4. Developer timely complies with the claims procedure of the Contract Documents.

52.4. Float or Slack in the Schedule

Float or slack is the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float or slack is not for the exclusive use of or benefit of either the District or the Developer, but its use shall be determined solely by the District.

53.Changes in the Work

53.1. No Changes without Authorization

53.1.1. There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order or a written Construction Change Directive authorized by the District as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District's governing board has authorized the same and the cost thereof has been approved in writing by Change Order or Construction Change Directive in advance of the changed Work being performed. No extension of time for performance of the Work shall be allowed hereunder unless a request for such extension is made at the time changes in the Work are ordered, and such time duly adjusted and approved in writing in the Change Order or Construction Change Directive. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

53.1.2. Developer shall perform immediately all work that has been authorized by a fully executed Change Order or Construction Change

Directive. Developer shall be fully responsible for any and all delays and/or expenses caused by Developer's failure to expeditiously perform this Work.

53.1.3. Should any Change Order result in an increase in the Guaranteed Maximum Price or extend the Contract Time, the cost of or length of extension in that Change Order shall be agreed to, in writing, by the District in advance of the work by Developer. In the event that Developer proceeds with any change in Work without a Change Order executed by the District or Construction Change Directive, Developer waives any claim of additional compensation or time for that additional work. Under no circumstances shall Developer be entitled to any claim of additional compensation or time not expressly requested by Developer in a Proposed Change Order or approved by District in an executed Change Order.

53.1.4. Developer understands, acknowledges, and agrees that the reason for District authorization is so that District may have an opportunity to analyze the Work and decide whether the District shall proceed with the Change Order or alter the Project so that a change in Work becomes unnecessary.

53.2. Architect Authority

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Guaranteed Maximum Price, or an extension of the Contract Time, or a change that is inconsistent with the intent of the Contract Documents. These changes shall be affected by written Change Order, Construction Change Directive, or by Architect's response(s) to RFI(s), or by Architect's Supplemental Instructions ("ASI").

53.3. Change Orders

A Change Order is a written instrument prepared and issued by the District and/or the Architect and signed by the District (as authorized by the District's Board of Education), the Developer, the Architect, and approved by the Project Inspector (if necessary) and DSA (if necessary), stating their agreement regarding all of the following:

53.3.1. A description of a change in the Work.

53.3.1.1 The amount of the adjustment in the Guaranteed Maximum Price, if any; and

53.3.1.2 The extent of the adjustment in the Contract Time, if any.

53.3.2. Changes in Guaranteed Maximum Price

A Change Order Request ("COR") shall include breakdowns pursuant to the provisions herein to validate any change in Guaranteed Maximum Price.

53.3.3. Unknown and/or Unforeseen Conditions

If Developer submits a COR requesting an increase in Guaranteed Maximum Price and/or Contract Time that is based at least partially on Developer's

assertion that Developer has encountered unknown and/or unforeseen condition(s) on the Project, then Developer shall base the COR on provable information that, to the District's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen and that the condition(s) were reasonably unknown and/or unforeseen. If not, the District shall deny the COR and the Developer shall complete the Project without any increase in Guaranteed Maximum Price and/or Contract Time based on that COR.

53.4. Proposed Change Order

53.4.1. Definition of Proposed Change Order

A Proposed Change Order ("PCO") is a written request prepared by the Developer requesting that the District and the Architect issue a Change Order based upon a proposed change to the Work, to the Guaranteed Maximum Price, and/or to the Contract Time.

53.4.2. Changes in Guaranteed Maximum Price

A PCO shall include breakdowns and backup documentation pursuant to the provisions herein and sufficient, in the District's judgment, to validate any change in Guaranteed Maximum Price. In no case shall Developer or any of its Subcontractors be permitted to reserve rights for additional compensation for Change Order Work.

53.4.3. Changes in Time

A PCO shall also include any changes in time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change but must be based upon the impact to the Construction Schedule as defined in the Contract Documents. If Developer fails to request a time extension in a PCO, then the Developer is thereafter precluded from requesting, and waives any right to request, additional time and/or claiming a delay. In no case shall Developer or any of its Subcontractors be permitted to reserve rights for additional time for Change Order Work. A PCO that leaves the amount of time requested blank, or states that such time requested is "to be determined", is not permitted and shall also constitute a waiver of any right to request additional time and/or claim a delay.

53.4.4. Unknown and/or Unforeseen Conditions

If Developer submits a PCO requesting an increase in Guaranteed Maximum Price and/or Contract Time that is based at least partially on Developer's assertion that Developer has encountered unknown and/or unforeseen condition(s) on the Project, then Developer shall base the PCO on provable information that, beyond a reasonable doubt and to the District's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen. If not, the District shall deny the PCO as unsubstantiated, and the Developer shall complete the Project without any

increase in Guaranteed Maximum Price and/or Contract Time based on that PCO.

53.5. Proposed Change Order Certification

In submitting a PCO, Developer certifies and affirms that the cost and/or time request is submitted in good faith, that the cost and/or time request is accurate and in accordance with the provisions of the Contract Documents, and the Developer submits the cost and/or request for extension of time recognizing the significant civil penalties and treble damages which follow from making a false claim or presenting a false claim under Government Code section 12650, *et seq.*

53.6. Format for Proposed Change Order

53.6.1. The format at section 17.6 shall be used as applicable by the District and the Developer (e.g. Change Orders, PCOs) to communicate proposed additions and/or deductions to the Contract, supported by attached documentation.

53.6.2. Labor

Developer shall be compensated for the costs of labor actually and directly utilized in the performance of the Work. Such labor costs shall be limited to field labor for which there is a prevailing wage rate classification. Wage rates for labor shall not exceed the prevailing wage rates in the locality of the Site and shall be in the labor classification(s) necessary for the performance of the Work. Labor costs shall exclude costs incurred by the Developer in preparing estimate(s) of the costs of the change in the Work, in the maintenance of records relating to the costs of the change in the Work, coordination and assembly of materials and information relating to the change in the Work or performance thereof, or the supervision and other overhead and general conditions costs associated with the change in the Work or performance thereof.

53.6.3. Materials

Developer shall be compensated for the costs of materials necessarily and actually used or consumed in connection with the performance of the change in the Work. Costs of materials may include reasonable costs of transportation from a source closest to the Site of the Work and delivery to the Site. If discounts by material suppliers are available for materials necessarily used in the performance of the change in the Work, they shall be credited to the District. If materials necessarily used in the performance of the change in the Work are obtained from a supplier or source owned in whole or in part by the Developer, compensation therefor shall not exceed the current wholesale price for such materials. If, in the reasonable opinion of the District, the costs asserted by the Developer for materials in connection with any change in the Work are excessive, or if the Developer fails to provide satisfactory evidence of the actual costs of such materials from its supplier or vendor of the same, the costs of such materials and the District's obligation to

pay for the same shall be limited to the then lowest wholesale price at which similar materials are available in the quantities required to perform the change in the Work. The District may elect to furnish materials for the change in the Work, in which event the Developer shall not be compensated for the costs of furnishing such materials or any mark-up thereon.

53.6.4. Equipment

As a precondition to the District's duty to pay for Equipment rental or loading and transportation, Developer shall provide satisfactory evidence of the actual costs of Equipment from the supplier, vendor or rental agency of same. Developer shall be compensated for the actual cost of the necessary and direct use of Equipment in the performance of the change in the Work. Use of Equipment in the performance of the change in the Work shall be compensated in increments of fifteen (15) minutes. Rental time for Equipment moved by its own power shall include time required to move the Equipment to the site of the Work from the nearest available rental source of the same. If Equipment is not moved to the Site by its own power, Developer will be compensated for the loading and transportation costs in lieu of rental time. The foregoing notwithstanding, neither moving time or loading and transportation time shall be allowed if the Equipment is used for performance of any portion of the Work other than the change in the Work. Unless prior approval in writing is obtained by the Developer from the Architect, the Project Inspector, the Construction Manager and the District, no costs or compensation shall be allowed for time while Construction Equipment is inoperative, idle or on standby, for any reason. Developer shall not be entitled to an allowance or any other compensation for Equipment or tools used in the performance of a change in the Work where the Equipment or tools have a replacement value of \$500.00 or less. Equipment costs claimed by the Developer in connection with the performance of any Work shall not exceed rental rates established by distributors or construction equipment rental agencies in the locality of the Site; any costs asserted which exceed such rental rates shall not be allowed or paid. Unless otherwise specifically approved in writing by the Architect, the Project Inspector, Construction Manager and the District, the allowable rate for the use of Equipment in connection with the Work shall constitute full compensation to the Developer for the cost of rental, fuel, power, oil, lubrication, supplies, necessary attachments, repairs or maintenance of any kind, depreciation, storage, insurance, labor (exclusive of labor costs of the Equipment operator), and any and all other costs incurred by the Developer incidental to the use of the Equipment.

53.6.5. Overhead and Profit.

The phrase "Overhead and Profit" shall include field and office supervisors and assistants, watchperson, use of small tools, consumable, insurance other than construction bonds and insurance required herein, and general field and home office expenses.

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53.7. Format for Change Order Request and Proposed Change Order

The following format shall be used as applicable by the District and the Developer (e.g. Change Orders, PCO's) to communicate proposed additions and deductions to the Contract Documents, supported by attached documentation. Any spaces left blank will be deemed no change to cost or time.

	<u>SUBCONTRACTOR PERFORMED WORK</u>	ADD	DEDUCT
(a)	<u>Material</u> (attach supplier's invoice or itemized quantity and unit cost plus sales tax)		
(b)	<u>Add Labor</u> (attach itemized hours and rates, fully encumbered)		
(c)	<u>Add Equipment</u> (attach suppliers' invoice)		
(d)	<u>Subtotal</u>		
(e)	<u>Add Subcontractor's overhead and profit</u> , not to exceed five percent (10%) of Item (d)		
(f)	<u>Subtotal</u>		
(g)	<u>Add Developer's overhead and profit</u> , not to exceed four and one-half percent (4.5%) of Item (f)		
(h)	<u>Subtotal</u>		
(i)	<u>Add Bond and Insurance</u> , at Developer's Cost, not to exceed one and one-half percent (1.5%) of Item (h)		
(j)	<u>TOTAL</u>		
(k)	<u>Time</u> (zero unless indicated; "TBD" not permitted)	___ Calendar Days	

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	<u>DEVELOPER PERFORMED WORK</u>		
(a)	<u>Material</u> (attach supplier's invoice or itemized quantity and unit cost plus sales tax)		
(b)	<u>Add Labor</u> (attach itemized hours and rates, fully encumbered)		
(c)	<u>Add Equipment</u> (attach suppliers' invoice)		
(d)	<u>Subtotal</u>		
(e)	Add Developer's overhead and profit , not to exceed nine and one-half percent (9.5%) of Item (d) .		
(f)	<u>Subtotal</u>		
(g)	<u>Add Bond and Insurance</u> , at Developer's Cost, not to exceed one and one-half percent (1.5%) of Item (h)		
(h)	<u>TOTAL</u>		
(i)	<u>Time</u> (zero unless indicated; "TBD" not permitted)	___ Calendar Days	

53.8. Change Order Certification

53.8.1. All Change Orders, CORs, and PCOs must include the following certification by the Developer:

The undersigned Developer approves the foregoing as to the changes, if any, and to the Guaranteed Maximum Price specified for each item and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Developer knows are false are at the sole risk of Developer and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq. and U.S. Criminal Code, 18 U.S.C. § 1001. It is understood that the changes herein to the Contract Documents shall only be effective when approved by the governing board of the District.

It is expressly understood that the value of the extra Work or changes expressly includes any and all of the Developer's costs and expenses, both direct and indirect, resulting from additional time required on the Project or

resulting from delay to the Project. Developer is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

53.9. Determination of Change Order Cost

53.9.1. The amount of the increase or decrease in the Guaranteed Maximum Price from a Change Order, if any, shall be determined in one or more of the following ways as applicable to a specific situation and at the District's discretion:

53.9.1.1 District acceptance of a COR or PCO.

53.9.1.2 By amounts contained in Developer's schedule of values, if applicable.

53.9.1.3 By agreement between District and Developer.

53.10. Deductive Change Orders

All deductive Change Order(s) must be prepared pursuant to the provisions herein. Where a portion of the Work is deleted from the Contract, the reasonable value of the deleted work less the value of any new work performed shall be considered the appropriate deduction. The value submitted on the Schedule of Values shall be used to calculate the credit amount unless the bid documentation is being held in escrow as part of the Contract Documents. If Developer offers a proposed amount for a deductive Change Order(s) for work performed directly by the Developer, Developer shall include a minimum of nine and one-half percent (9.5%) total profit and overhead to be deducted with the amount of the work of the Change Order(s). If Subcontractor work is involved, Subcontractors shall include a minimum of five percent (5%) profit and overhead to be deducted with the amount of its deducted work and Developer shall include a minimum of four and one-half percent (4.5%). Any deviation from this provision shall not be allowed.

53.11. Addition or Deletion of Alternate Bid Item(s)

53.11.1. If a subcontractor's Bid Form and Proposal includes proposal(s) for Alternate Bid Item(s), during Developer's performance of the Work, the District may elect to add or delete any such Alternate Bid Item(s) if not included in the Contract at the time of award. If the District elects to add or delete Alternate Bid Item(s) after Contract award, the cost or credit for such Alternate Bid Item(s) shall be as set forth in the Bid Form and Proposal unless the parties agree to a different price and the Contract Time shall be adjusted by the number of days allocated in the Contract Documents.

53.11.2. For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Developer, and the Developer shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the

Developer's cost in determining the actual cost of construction for purposes of any change, addition, or omission in the Work as provided herein.

53.12. Construction Change Directives

53.12.1. A Construction Change Directive is a written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work. The District may, as provided by law, by Construction Change Directive and without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions. The adjustment to the Guaranteed Maximum Price or Contract Time, if any, is subject to the provision of this section regarding Changes in the Work. If all or a portion of the Project is being funded by funds requiring approval by the State Allocation Board ("SAB"), these revisions may be subject to compensation once approval of same is received and funded by the SAB, and funds are released by the Office of Public School Construction ("OPSC"). Any dispute as to the adjustment of the Guaranteed Maximum Price, if any, of the Construction Change Directive or timing of payment shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

53.12.2. The District may issue a Construction Change Directive in the absence of agreement on the terms of a Change Order.

53.13. Force Account Directives

53.13.1. When work, for which a definite price has not been agreed upon in advance, is to be paid for on a force account basis, all direct costs necessarily incurred and paid by the Developer for labor, material, and equipment used in the performance of that Work, shall be subject to the approval of the District and compensation will be determined as set forth herein.

53.13.2. The District will issue a Force Account Directive to proceed with the Work on a force account basis, and a not-to-exceed budget will be established by the District.

53.13.3. All requirements regarding direct cost for labor, labor burden, material, equipment, and markups on direct costs for overhead and profit described in this section shall apply to Force Account Directives. However, the District will only pay for actual costs verified in the field by the District or its authorized representative(s) on a daily basis.

53.13.4. The Developer shall be responsible for all costs related to the administration of Force Account Directives. The markup for overhead and profit for Developer modifications shall be full compensation to the Developer to administer Force Account Directives, and Developer shall not be entitled to separately recover additional amounts for overhead and/or profit.

53.13.5. The Developer shall notify the District or its authorized representative(s) at least twenty-four (24) hours prior to proceeding with any of the force account work. Furthermore, the Developer shall notify the District when it has consumed eighty percent (80%) of the budget, and shall not exceed the budget unless specifically authorized in writing by the District.

The Developer will not be compensated for force account work in the event that the Developer fails to timely notify the District regarding the commencement of force account work, or exceeding the force account budget.

53.13.6. The Developer shall diligently proceed with the work, and on a daily basis, submit a daily force account report no later than 5:00 p.m. each day on a form supplied by the District. The report shall contain a detailed itemization of the daily labor, material, and equipment used on the force account work only. The names of the individuals performing the force account work shall be included on the daily force account reports. The type and model of equipment shall be identified and listed. The District will review the information contained in the reports, and sign the reports no later than the next work day, and return a copy of the report to the Developer for its records. The District will not sign, nor will the Developer receive compensation for, work the District cannot verify. The Developer will provide a weekly force account summary indicating the status of each Force Account Directive in terms of percent complete of the not-to-exceed budget and the estimated percent complete of the work

53.13.7. In the event the Developer and the District reach a written agreement on a set cost for the work while the work is proceeding based on a Force Account Directive, the Developer's signed daily force account reports shall be discontinued and all previously signed reports shall be invalid.

53.14. Price Request

53.14.1. Definition of Price Request

A Price Request ("PR") is a written request prepared by the Architect or Construction Manager requesting the Developer submit to the District, the Construction Manager and the Architect an estimate of the effect of a proposed change in the Work on the Guaranteed Maximum Price and the Contract Time.

53.14.2. Scope of Price Request

A Price Request shall contain adequate information, including any necessary Drawings and Specifications, to enable Developer to provide the cost breakdowns required. The Developer shall not be entitled to any additional compensation for preparing a response to a Price Request, whether ultimately accepted or not.

53.15. Accounting Records

With respect to portions of the Work performed by Change Orders and Construction Change Directives, the Developer shall keep and maintain cost-accounting records satisfactory to the District, including, without limitation, Job Cost Reports as provided in these General Conditions, which shall be available to the District on the same terms as any other books and records the Developer is required to maintain under the Contract Documents. Such records shall include without limitation hourly records for Labor and Equipment and itemized records of materials and Equipment used that

day in connection with the performance of any Work. All records maintained hereunder shall be subject to inspection, review and/or reproduction by the District, the Construction Manager and the Architect or the Project Inspector upon request. In the event that the Developer fails or refuses, for any reason, to maintain or make available for inspection, review and/or reproduction such records, the District's determination of the extent of adjustment to the Contract Price shall be final, conclusive, dispositive and binding upon Developer.

53.16. Notice Required

If the Developer desires to make a claim for an increase in the Guaranteed Maximum Price, or any extension in the Contract Time for completion, it shall notify the District pursuant to the provisions herein, including the Article on Claims and Disputes. No claim shall be considered unless made in accordance with this subparagraph. Developer shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Guaranteed Maximum Price or extension of the Contract Time resulting from such claim shall be authorized by a Change Order.

53.17. Applicability to Subcontractors

Any requirements under this Article shall be equally applicable to Change Orders or Construction Change Directives issued to Subcontractors by the Developer to the extent required by the Contract Documents.

53.18. Alteration to Change Order Language

Developer shall not alter Change Orders or reserve time in Change Orders. Change Orders altered in violation of this provision, if in conflict with the terms set forth herein, shall be construed in accordance with the terms set forth herein. Developer shall execute finalized Change Orders and proceed under the provisions herein with proper notice.

53.19. Failure of Developer to Execute Change Order

Developer shall be in default of the Contract Documents if Developer fails to execute a Change Order when the Developer agrees with the addition and/or deletion of the Work in that Change Order.

54. Requests For Information

54.1. Any Request for Information shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. The Developer shall make suggestions and interpretations of the issue raised by each Request for Information. A Request for Information cannot modify the Guaranteed Maximum Price, Contract Time, or the Contract Documents.

54.2. The Developer may be responsible for any costs incurred for professional services that District may deduct from any amounts owing to the Developer, if a Request for Information requests an interpretation or decision of a matter where the

information sought is equally available to the party making the request. District may deduct from and/or invoice Developer for professional services arising therefrom.

55. Payments

55.1. Guaranteed Maximum Price

As compensation for Developer's construction of the Project, the District shall pay Developer pursuant to the terms of Exhibit "C" to the Facilities Lease. This is the total amount payable by the District to the Developer for performance of the Work under the Contract.

55.2. Applications for Tenant Improvement Payments

55.2.1. Procedure for Applications for Tenant Improvement Payments

55.2.1.1 Not before the fifth (5th) day of each calendar month during the progress of the Work, Developer shall submit to the District and the Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be on a form approved by the District and shall be notarized, if required, and supported by the following or each portion thereof unless waived by the District in writing:

55.2.1.1.1. The amount paid to the date of the Application for Payment to the Developer, to all its Subcontractors, and all others furnishing labor, material, or equipment under the Contract Documents.

55.2.1.1.2. The amount being requested under the Application for Payment by the Developer on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract Documents.

55.2.1.1.3. The balance that will be due to each of such entities after said payment is made.

55.2.1.1.4. A certification that the As-Built Drawings and annotated Specifications are current.

55.2.1.1.5. Itemized breakdown of work done for the purpose of requesting partial payment.

55.2.1.1.6. An updated and acceptable construction schedule in conformance with the provisions herein.

55.2.1.1.7. The additions to and subtractions from the Guaranteed Maximum Price and Contract Time.

55.2.1.1.8. A total of the retentions held.

55.2.1.1.9. Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time.

55.2.1.1.10. The percentage of completion of the Developer's Work by line item.

55.2.1.1.11. Schedule of Values updated from the preceding Application for Payment.

55.2.1.1.12. A duly completed and executed conditional waiver and release upon Tenant Improvement Payment compliant with Civil Code section 8132 from the Developer and each subcontractor of any tier and supplier to be paid from the current Tenant Improvement Payment.

55.2.1.1.13. A duly completed and executed unconditional waiver and release upon Tenant Improvement Payment compliant with Civil Code section 8134 from the Developer and each subcontractor of any tier and supplier that was paid from the previous Tenant Improvement Payment submitted 60 days prior; and

55.2.1.1.14. A certification by the Developer of the following:

The Developer warrants title to all Work performed as of the date of this payment application and that all such Work has been completed in accordance with the Contract Documents for the Project. The Developer further warrants that all Work performed as of the date of this payment application is free and clear of liens, claims, security interests, or encumbrances in favor of the Developer, Subcontractors, material and equipment suppliers, workers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work, except those of which the District has been informed. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 *et seq.*

55.2.1.1.15. The Developer shall be subject to the False Claims Act set forth in Government Code section 12650 *et seq.* for information provided with any Application for Tenant Improvement Payments.

55.2.1.1.16. All remaining certified payroll records ("CPR(s)") for each journeyman, apprentice, worker, or other employee employed by the Developer and/or each Subcontractor in connection with the Work for the period of the Application for Payment. As indicated herein, the District shall not make any payment to Developer until:

55.2.1.1.16.1. Developer and/or its Subcontractor(s) provide electronic CPRs weekly for all weeks any journeyman, apprentice, worker or other employee was employed in connection with the Work directly to the DIR, or within ten (10) days of any request by the District or the DIR; and

55.2.1.1.16.2. Any delay in Developer and/or its Subcontractor(s) providing CPRs in a timely manner may directly delay the Developer's payment.

55.2.1.1.17. Applications received after June 20th will not be paid until the second week of July and applications received after December 12th will not be paid until the first week of January.

55.2.2. Prerequisites for Tenant Improvement Payments

55.2.2.1 First Payment Request

The following items, if applicable, must be completed before the District will accept and/or process the Developer's first payment request:

55.2.2.1.1. Installation of the Project sign.

55.2.2.1.2. Installation of field office.

55.2.2.1.3. Installation of temporary facilities and fencing.

55.2.2.1.4. Schedule of Values.

55.2.2.1.5. Developer's Construction Schedule.

55.2.2.1.6. Schedule of unit prices, if applicable.

55.2.2.1.7. Submittal Schedule.

55.2.2.1.8. Receipt by Architect of all submittals due as of the date of the payment application.

55.2.2.1.9. Copies of necessary permits.

55.2.2.1.10. Initial progress report.

55.2.2.1.11. List of Subcontractors, with names, license numbers, telephone numbers, and Scope of Work.

55.2.2.1.12. All bonds and insurance endorsements; and

55.2.2.1.13. Resumes of Developer's project manager, and if applicable, job site secretary, record documents recorder, and job site superintendent.

55.2.3. Subsequent Payment Requests

The District will not process subsequent payment requests until and unless submittals and Shop Drawings necessary to maintain the Project schedule have been submitted to the Architect.

55.2.4. No Waiver of Criteria

Any payments made to Developer where criteria set forth herein have not been met shall not constitute a waiver of said criteria by District. Instead, such payment shall be construed as a good faith effort by District to resolve differences, so Developer may pay its Subcontractors and suppliers. Developer agrees that failure to submit such items may constitute a breach of contract by Developer and may subject Developer to termination.

55.3. District's Approval of Application for Payment

55.3.1. Upon receipt of an Application for Payment, The District shall act in accordance with both of the following:

55.3.1.1 Each Application for Payment shall be reviewed by the District as soon as practicable after receipt for the purpose of determining that the Application for Payment is a proper Application for Payment.

55.3.1.2 Any Application for Payment determined not to be a proper Application for Payment suitable for payment shall be returned to the Developer as soon as practicable, but not later than seven (7) days, after receipt. An Application for Payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the Application for Payment is not proper. The number of days available to the District to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the District exceeds this seven-day return requirement.

55.3.2. An Application for Payment shall be considered properly executed if funds are available for payment of the Application for Payment, and payment is not delayed due to an audit inquiry by the financial officer of the District.

55.3.3. The District's review of the Developer's Application for Payment will be based on the District's and the Architect's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the District's and the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to:

55.3.3.1 Observation of the Work for general conformance with the Contract Documents.

55.3.3.2 Results of subsequent tests and inspections.

55.3.3.3 Minor deviations from the Contract Documents correctable prior to completion; and

55.3.3.4 Specific qualifications expressed by the Architect.

55.3.4. District's approval of the certified Application for Payment shall be based on Developer complying with all requirements for a fully complete and valid certified Application for Payment.

55.3.5. Payments to Developer

55.3.5.1 Within thirty (30) days after approval of the Application for Payment, Developer shall be paid a sum equal to ninety-five percent (95%), of the value of the Tenant Improvement Payment (as verified by Architect and Inspector and certified by Developer) up to the last day of the previous month, less the aggregate of previous payments and amount to be withheld. The value of the Work completed shall be Developer's best estimate. No inaccuracy or error in said estimate shall operate to release the Developer, or any Surety upon any bond, from damages arising from such Work, or from the District's right to enforce each and every provision of the Contract Documents, and the District shall have the right subsequently to correct any error made in any estimate for payment.

55.3.5.2 The Developer may not be entitled to have payment requests processed, or may be entitled to have only partial payment made for Work performed, so long as any direction given by the District concerning the Work, or any portion thereof, remains incomplete.

55.3.6. No Waiver

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the District may enforce each and every provision of this Contract. The District may correct or require correction of any error subsequent to any payment

55.3.7. Warranty of Title

55.3.7.1 If a lien or a claim based on a stop payment notice of any nature should at any time be filed against the Work or any District property, by any entity that has supplied material or services at the request of the Developer, Developer and Developer's Surety shall promptly, on demand by District and at Developer's and Surety's own expense, take any and all action necessary to cause any such lien or a claim based on a stop payment notice to be released or discharged immediately therefrom.

55.3.7.2 If the Developer fails to furnish to the District within ten (10) calendar days after demand by the District satisfactory evidence

that a lien or a claim based on a stop payment notice has been released, discharged, or secured, the District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expenses incurred or suffered by District from any sum payable to Developer under the Contract.

55.4. Decisions to Withhold Payment

55.4.1. Reasons to Withhold Payment

The District shall withhold payment in whole, or in part, as required by statute. In addition, the District may withhold payment in whole, or in part, to the extent reasonably necessary to protect the District if, in the District's opinion, the representations to the District required herein cannot be made. Payment, in whole, or in part, will be withheld based on the need to protect the District from loss because of, but not limited to, any of the following:

55.4.1.1 Defective Work not remedied within FORTY-EIGHT (48) hours of written notice to Developer.

55.4.1.2 Stop Payment Notices or other liens served upon the District as a result of the Contract.

55.4.1.3 Failure to provide to the District a complete, monthly report demonstrating that Developer and its Subcontractors are complying with the requirements of Public Contract Code section 2600 et seq., unless Developer and its subcontractors have agreed to be bound by a Project Labor Agreement as provided in Education Code section 17407.5. ("Skilled and Trained Workforce Requirements").

55.4.1.3.1. Failure to provide a monthly report is cured by providing a complete report.

55.4.1.3.2. Failure to demonstrate compliance with the Skilled and Trained Workforce Requirements is cured by providing a plan to achieve substantial compliance with the Skilled and Trained Workforce Requirements, with respect to the relevant apprenticeable occupation, prior to completion of the Project.

55.4.1.4 Liquidated damages assessed against the Developer.

55.4.1.5 The cost of completion of the Contract if there exists reasonable doubt that the Work can be completed for the unpaid balance of the Guaranteed Maximum Price or by the Contract Time.

55.4.1.6 Damage to the District or other contractor(s).

55.4.1.7 Unsatisfactory prosecution of the Work by the Developer.

55.4.1.8 Failure to store and properly secure materials.

55.4.1.9 Failure of the Developer to submit, on a timely basis, proper, sufficient, and acceptable documentation required by the Contract Documents, including, without limitation, a Construction Schedule, Schedule of Submittals, Schedule of Values, Monthly Progress Schedules, Shop Drawings, Product Data and samples, Proposed product lists, executed Change Orders, and/or verified reports.

55.4.1.10 Failure of the Developer to maintain As-Built Drawings.

55.4.1.11 Erroneous estimates by the Developer of the value of the Work performed, or other false statements in an Application for Payment.

55.4.1.12 Unauthorized deviations from the Contract Documents.

55.4.1.13 Failure of the Developer to prosecute the Work in a timely manner in compliance with the Construction Schedule, established progress schedules, and/or completion dates.

55.4.1.14 Failure to provide acceptable electronic certified payroll records, as required by the Labor Code, by these Contract Documents or by written request for each journeyman, apprentice, worker, or other employee employed by the Developer and/or by each Subcontractor in connection with the Work for the period of the Application for Payment or if payroll records are delinquent or inadequate.

55.4.1.15 Failure to properly pay prevailing wages as required in Labor Code section 1720 et seq., failure to comply with any other Labor Code requirements, and/or failure to comply with labor compliance monitoring and enforcement by the DIR.

55.4.1.16 Failure to comply with any, if applicable federal requirements regarding minimum wages, withholding, payrolls and basic records, apprentice and trainee employment requirements, equal employment opportunity requirements, Copeland Act requirements, Davis-Bacon Act and related requirements, Contract Work Hours and Safety Standards Act requirements.

55.4.1.17 Failure to properly maintain or clean up the Site.

55.4.1.18 Failure to timely indemnify, defend, or hold harmless the District.

55.4.1.19 Failure to perform any implementation and/or monitoring required by the General Permit, including without limitation any SWPPP for the Project and/or the imposition of any penalties or fines therefore whether imposed on the District or Developer.

55.4.1.20 Any payments due to the District, including but not limited to payments for failed tests, utilities changes, or permits.

55.4.1.21 Failure to pay any royalty, license or similar fees.

55.4.1.22 Failure to pay Subcontractor(s) or supplier(s) as required by law and Developer's subcontract agreement and by the Contract Documents; and

55.4.1.23 Developer is otherwise in breach, default, or in substantial violation of any provision of the Contract Documents.

55.4.2. Reallocation of Withheld Amounts

55.4.2.1 District may, in its discretion, apply any withheld amount to pay outstanding claims or obligations as defined herein. In so doing, District shall make such payments on behalf of Developer. If any payment is so made by District, then that amount shall be considered a payment made under the Contract Documents by District to Developer and District shall not be liable to Developer for any payment made in good faith. These payments may be made without prior judicial determination of claim or obligation. District will render Developer an accounting of funds disbursed on behalf of Developer.

55.4.2.2 If Developer defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to perform any provision thereof, District may, after FORTY-EIGHT (48) hours' written notice to the Developer and opportunity to commence and pursue cure of default, and, without prejudice to any other remedy, make good such deficiencies. The District shall adjust the total Guaranteed Maximum Price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work that is damaged, defective, or not done in accordance with the provisions of the Contract Documents, an equitable reduction in the Guaranteed Maximum Price (of at least one hundred twenty-five percent (125%) of the estimated reasonable value of the nonconforming Work) shall be made therefor.

55.4.3. Payment After Cure

When Developer removes the grounds for declining approval, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Developer to perform in accordance with the terms and conditions of the Contract Documents.

55.5. Subcontractor Payments

55.5.1. Payments to Subcontractors

No later than seven (7) days after receipt of any Tenant Improvement Payment, or pursuant to Business and Professions Code section 7108.5 and Public Contract Code section 7107, the Developer shall pay to each Subcontractor, out of the amount paid to the Developer on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor

is entitled. The Developer shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in a similar manner.

55.5.2. No Obligation of District for Subcontractor Payment

The District shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

55.5.3. Joint Checks

District shall have the right in its sole discretion, if necessary for the protection of the District, to issue joint checks made payable to the Developer and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the District and a Subcontractor of any tier, or a material or equipment supplier, or any obligation from the District to such Subcontractor or a material or equipment supplier or rights in such Subcontractor against the District.

56. Completion of the Work

56.1. Completion

56.1.1. District will accept completion of Project and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District.

56.1.2. The Work may only be accepted as complete by action of the governing board of the District.

56.1.3. District, at its sole option, may accept completion of Project and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District, except for minor corrective items, as distinguished from incomplete items. If Developer fails to complete all minor corrective items within fifteen (15) days after the date of the District's acceptance of completion, District shall withhold from the final payment one hundred fifty percent (150%) of an estimate of the amount sufficient to complete the corrective items, as determined by District, until the item(s) are completed.

56.1.4. At the end of the fifteen (15) day period, if there are any items remaining to be corrected, District may elect to proceed as provided herein related to adjustments to Guaranteed Maximum Price, and/or District's right to perform the Work of the Developer.

56.2. Close-Out/Certification Procedures

56.2.1. Punch List

The Developer shall notify the Architect when Developer considers the Work complete. Upon notification, Architect will prepare a list of minor items to be completed or corrected ("Punch List"). The Developer and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Developer to complete all Work in accordance with the Contract Documents.

56.2.2. Close-Out/Certification Requirements

56.2.2.1 Utility Connections

Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made, and existing services reconnected.

56.2.2.2 As-Builts/Record Drawings and Record Specifications

56.2.2.2.1. Developer shall provide exact "as-built" drawings of the Work upon completion of the Project as indicated in the Contract Documents, including but not limited to the Specifications ("As-Built Drawings") as a condition precedent to approval of final payment.

56.2.2.2.2. Developer is liable and responsible for any and all inaccuracies in the As-Built Drawings, even if inaccuracies become evident at a future date.

56.2.2.2.3. Upon completion of the Work and as a condition precedent to approval of final payment, Developer shall obtain the Inspector's approval of the corrected prints and employ a competent draftsman to transfer the As-Built Drawings information to the most current version of AutoCAD or Building Information Modeling ("BIM") or other 3d imaging model that is, at that time, currently utilized for plan check submission by either the District, the Architect, OPSC, and/or DSA, and print a complete set of transparent sepias. When completed, Developer shall deliver corrected sepias and diskette/CD/other data storage device acceptable to District with AutoCAD or BIM or other 3d imaging model file to the District.

56.2.3. Maintenance Manuals

Developer shall prepare all operation and maintenance manuals and date as indicated in the Specifications.

56.2.4. Source Programming

Developer shall provide all source programming for all items in the Project.

56.2.5. Verified Reports

Developer shall completely and accurately fill out and file forms DSA 6-C or DSA 152 (or most current version applicable at the time the Work is performed), as appropriate. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

56.3. Final Inspection

56.3.1. Developer shall comply with Punch List procedures as provided herein, and maintain the presence of its District-approved project superintendent and project manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Developer demobilize its forces prior to completion of the Punch List without District's prior written approval. Upon receipt of Developer's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, Architect and Project Inspector will inspect the Work and shall submit to Developer and District a final inspection report noting the Work, if any, required in order to complete in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

56.3.2. Upon Developer's completion of all items on the Punch List and any other uncompleted portions of the Work, the Developer shall notify the District and Architect, who shall again inspect such Work. If the Architect finds the Work complete and acceptable under the Contract Documents, the Architect will notify Developer, who shall then jointly submit to the Architect and the District its final Application for Payment.

56.3.3. Final Inspection Requirements

56.3.3.1 Before calling for final inspection, Developer shall determine that the following have been performed:

56.3.3.1.1. The Work has been completed.

56.3.3.1.2. All life safety items are completed and in working order.

56.3.3.1.3. Mechanical and electrical Work are complete and tested, fixtures are in place, connected, and ready for tryout.

56.3.3.1.4. Electrical circuits scheduled in panels and disconnect switches labeled.

56.3.3.1.5. Painting and special finishes complete.

56.3.3.1.6. Doors complete with hardware, cleaned of protective film, relieved of sticking or binding, and in working order.

56.3.3.1.7. Tops and bottoms of doors sealed.

56.3.3.1.8. Floors waxed and polished as specified.

56.3.3.1.9. Broken glass replaced and glass cleaned.

56.3.3.1.10. Grounds cleared of Developer's equipment, raked clean of debris, and trash removed from Site.

56.3.3.1.11. Work cleaned, free of stains, scratches, and other foreign matter, damaged and broken material replaced.

56.3.3.1.12. Finished and decorative work shall have marks, dirt, and superfluous labels removed.

56.3.3.1.13. Final cleanup, as provided herein.

56.4. Costs of Multiple Inspections

More than two (2) requests of the District to make a final inspection shall be considered an additional service of District, Architect, Construction Manager, and/or Project Inspector, and all subsequent costs will be invoiced to Developer and if funds are available, withheld from remaining payments.

56.5. Partial Occupancy or Use Prior to Completion

56.5.1. District's Rights to Occupancy

The District may occupy or use any completed or partially completed portion of the Work at any stage, and such occupancy shall not constitute the District's Final Acceptance of any part of the Work. Neither the District's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by District shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Developer or the Developer's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein. The District and the Developer shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. Any dispute as to responsibilities shall be resolved pursuant to the Claims and Disputes provisions herein, with the added provision that during the dispute process, the District shall have the right to occupy or use any portion of the Work that it needs or desires to use.

56.5.2. Inspection Prior to Occupancy or Use

Immediately prior to partial occupancy or use, the District, the Developer, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

56.5.3. No Waiver

Unless otherwise agreed upon, partial or entire occupancy or use of a portion or portions of the Work shall not constitute beneficial occupancy or acceptance of the Work not complying with the requirements of the Contract Documents.

57. Final Payment and Retention

57.1. Final Payment

Upon receipt and approval of a valid and final Application for Payment, the Architect will issue a final Certificate of Payment. The District shall thereupon jointly inspect the Work and either accept the Work as complete or notify the Architect and the Developer in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Developer as fully complete (that, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and the Developer shall, upon receipt of final payment from the District, pay the amount due Subcontractors.

57.2. Prerequisites for Final Payment

The following conditions must be fulfilled prior to Final Payment:

57.2.1. A full release of all Stop Payment Notices served in connection with the Work shall be submitted by Developer.

57.2.2. A duly completed and executed conditional waiver and release upon final payment compliant with Civil Code section 8136 from each subcontractor of any tier and supplier to be paid from the final Tenant Improvement Payment.

57.2.3. A duly completed and executed unconditional waiver and release upon Tenant Improvement Payment compliant with Civil Code section 8134 from each subcontractor of any tier and supplier that was paid from the previous Tenant Improvement Payment(s).

57.2.4. A duly completed and executed "AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS" from the Contractor.

57.2.5. The Developer shall have made all corrections to the Work that are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.

57.2.6. Each Subcontractor shall have delivered to the Developer all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

57.2.7. Developer must have completed all requirements set forth under "Close-Out/Certification Procedures," including, without limitation, submission of an approved set of complete Record Drawings.

57.2.8. Architect shall have issued its written approval that final payment can be made.

57.2.9. The Developer shall have delivered to the District all manuals and materials required by the Contract Documents, which must be approved by the District.

57.2.10. The Developer shall have completed final clean up as provided herein.

57.3. Retention

57.3.1. The retention, less any amounts disputed by the District or that the District has the right to withhold pursuant to provisions herein, shall be paid:

57.3.1.1 After approval by the District of the Architect of the Application and Certificate of Payment.

57.3.1.2 After the satisfaction of the conditions set forth herein.

57.3.1.3 No less than forty-five (45) days after the recording of the Notice of Completion by District; and

57.3.1.4 After receipt of a duly completed and executed unconditional waiver and release upon Final Payment compliant with Civil Code section 8138 from each subcontractor of any tier and supplier that was paid from the Final Payment.

57.3.2. No interest shall be paid on any retention, or on any amounts withheld due to a failure of the Developer to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the District and the Developer pursuant to Public Contract Code section 22300.

57.4. Substitution of Securities

The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

58. Uncovering of Work

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the District, the Project Inspector, or the Architect, be uncovered for the Project Inspector's or the Architect's observation and be corrected, replaced and/or recovered at the Developer's expense without change in the Guaranteed Maximum Price or Contract Time.

59. Nonconforming Work and Correction of Work

59.1. Nonconforming Work

59.1.1. Developer shall promptly remove from Premises all Work identified by District as failing to conform to the Contract Documents whether incorporated or not. Developer shall promptly replace and re-execute its own Work to comply with the Contract Documents without additional expense to the District and shall bear the expense of making good all work of other contractors destroyed or damaged by any removal or replacement pursuant hereto and/or any delays to the District or other contractors caused thereby.

59.1.2. If Developer does not commence to remove Work that District has identified as failing to conform to the Contract Documents within a reasonable time, not to exceed FORTY-EIGHT (48) hours after written notice and complete removal of work within a reasonable time, District may remove it and may store any material at Developer's expense. If Developer does not pay expense(s) of that removal within ten (10) days' time thereafter, District may, upon ten (10) days' written notice, sell any material at auction or at private sale and shall deduct all costs and expenses incurred by the District and/or District may withhold those amounts from payment(s) to Developer.

59.2. Correction of Work

59.2.1. Correction of Rejected Work

Pursuant to the notice provisions herein, the Developer shall promptly correct the Work rejected by the District, the Architect, or the Project Inspector as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Developer shall bear costs of correcting the rejected Work, including additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby.

59.2.2. One-Year Warranty Corrections

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established hereunder, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Developer shall correct it promptly after receipt of written notice from the District to do so. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation hereunder shall survive acceptance of the Work under the Contract Documents and termination of the Contract Documents. The District shall give such notice promptly after discovery of the condition.

59.3. District's Right to Perform Work

59.3.1. If the Developer should neglect to prosecute the Work properly or fail to perform any provisions of the Contract Documents, the District, after

providing FORTY-EIGHT (48) hours written notice and an opportunity to cure the failure, to the Developer, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Developer.

59.3.2. If it is found at any time, before or after completion of the Work, that Developer has varied from the Drawings and/or Specifications, including, but not limited to, variation in material, quality, form, or finish, or in the amount or value of the materials and labor used, District may require at its option:

59.3.2.1 That all such improper Work be removed, remade or replaced, and all work disturbed by these changes be made good by Developer at no additional cost to the District.

59.3.2.2 That the District deduct from any amount due Developer the sum of money equivalent to the difference in value between the work performed and that called for by the Drawings and Specifications; or

59.3.2.3 That the District exercise any other remedy it may have at law or under the Contract Documents, including but not limited to the District hiring its own forces or another contractor to replace the Developer's nonconforming Work, in which case the District shall either issue a deductive Change Order, a Construction Change Directive, or invoice the Developer for the cost of that work. Developer shall pay any invoices within thirty (30) days of receipt of same or District may withhold those amounts from payment(s) to Developer.

60.Termination And Suspension

The Parties' rights to terminate the Project are as indicated in the Facilities Lease. In the event of a termination of the Facilities Lease and notwithstanding any other provision in the Contract Documents, the Surety shall remain liable to all obligees under the Payment Bond and to the District under the Performance Bond for any claim related to the Project.

61.Claims Process

61.1. Performance during Claim Process

Developer and its subcontractors shall continue to perform its Work under the Contract and shall not cause a delay of the Work during any dispute, claim, negotiation, mediation, or arbitration proceeding, except by written agreement by the District.

61.2. Definition of Claim

61.2.1. Pursuant to Public Contract Code section 9204, the term "Claim" means a separate demand by the Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

61.2.1.1 A time extension, including without limitation, for relief of damages or penalties for delay assessed by the District under the Contract;

61.2.1.2 Payment by the District of money or damages arising from work done by, or on behalf of, the Developer pursuant to the Contract and payment of which is not otherwise expressly provided for or to which Developer is not otherwise entitled to; or

61.2.1.3 An amount of payment disputed by the District.

61.3. Claims Presentation

61.3.1. If Developer intends to apply for an increase in the Guaranteed Maximum Price or Contract Time for any reason including, without limitation, the acts of District or its agents, Developer shall, within thirty (30) days after the event giving rise to the Claim, give notice of the Claim in writing, including an itemized statement of the details and amounts of its Claim for any increase in the Guaranteed Maximum Price or time requested, including a Schedule Analysis and any and all other documentation substantiating Contractor's claimed damages. Otherwise, Developer shall have waived and relinquished its dispute against the District and Developer's claims for compensation or an extension of time shall be forfeited and invalidated.

61.3.2. The Claim shall identify:

61.3.2.1 The issues, events, conditions, circumstances and/or causes giving rise to the dispute;

61.3.2.2 The pertinent dates and/or durations and actual and/or anticipated effects on the Guaranteed Maximum Price, Contract Schedule milestones and/or Contract Time adjustments; and

61.3.2.3 The line-item costs for labor, material, and/or equipment, if applicable; or

61.3.2.4 A request by Contractor, if any, to waive the claims procedure under Public Contract Code section 9204 and proceed directly to the commencement of a civil action or binding arbitration.

61.3.3. The Claim shall include the following certification by the Developer:

61.3.3.1 The undersigned Developer certifies under penalty of perjury that the attached dispute is made in good faith; that the supporting data is accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the adjustment for which Developer believes the District is liable; and that I am duly authorized to certify the claim on behalf of the Developer.

61.3.3.2 Furthermore, Developer understands that the value of the attached dispute expressly includes any and all of the Developer's costs and expenses, direct and indirect, resulting from the Work performed on the Project, additional time required on the Project and/or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included are deemed waived.

61.4. Claim Resolution pursuant to Public Contract Code section 9204

61.4.1. STEP 1:

61.4.1.1 Upon receipt of a Claim by registered or certified mail, return receipt requested, including the documents necessary to substantiate it, the District shall conduct a reasonable review of the Claim and, within a period **not to exceed 45 days**, shall provide the Developer a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the District and Developer may, **by mutual agreement**, extend the time period to provide a written statement. If the District needs approval from its governing body to provide the Developer a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of Claim sent by registered mail or certified mail, return receipt requested, the District shall have **up to three (3) days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension**, expires to provide Contractor a written statement identifying the disputed portion and the undisputed portion.

61.4.1.1.1. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. Amounts not paid in a timely manner as required by this section, section 25.4, shall bear interest at seven percent (7%) per annum.

61.4.1.2 Upon receipt of a Claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable. In this instance, District and Developer must comply with the sections below regarding Public Contract Code section 20104 et seq. and Government Code Claim Act Claims.

61.4.1.3 If the District fails to issue a written statement, or to otherwise meet the time requirements of this section, this shall result in the Claim being deemed rejected in its entirety. A claim that is denied by reason of the District's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of Developer.

61.4.2. STEP 2:

61.4.2.1 If Developer disputes the District's written response, or if the District fails to respond to a Claim within the time prescribed, Developer may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute,

the District shall provide the Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed.

61.4.2.2 Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the District issues its written statement. Amounts not paid in a timely manner as required by this section, section 25.4, shall bear interest at seven percent (7%) per annum.

61.4.3. STEP 3:

61.4.3.1 Any disputed portion of the claim, as identified by Developer in writing, shall be submitted to nonbinding mediation, with the District and Developer sharing the associated costs equally. The District and Developer shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

61.4.3.1.1. For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

61.4.3.2 Unless otherwise agreed to by the District and Contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Public Contract Code section 20104.4 to mediate after litigation has been commenced.

61.4.4. STEP 4:

61.4.4.1 If mediation under this section does not resolve the parties' dispute, the District may, but does not require arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program.

61.5. Subcontractor Pass-Through Claims

61.5.1. If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a District because privity of contract does not exist, the contractor may present to the District a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that Developer present a Claim for work which was performed

by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the Claim be presented to the District shall furnish reasonable documentation to support the Claim.

61.5.2. Within 45 days of receipt of this written request from a subcontractor, Developer shall notify the subcontractor in writing as to whether the Developer presented the Claim to the District and, if Developer did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.

61.5.3. Developer shall bind all its Subcontractors to the provisions of this section and will hold the District harmless against Claims by Subcontractors.

61.6. Government Code Claim Act Claim

61.6.1. If a Claim, or any portion thereof, remains in dispute upon satisfaction of all applicable Claim Resolution requirements, including those pursuant to Public Contract Code section 9204, the Developer shall comply with all claims presentation requirements as provided in Chapter 1 (commencing with section 900) and Chapter 2 (commencing with section 910) of Part 3 of Division 3.6 of Title 1 of Government Code as a condition precedent to the Developer's right to bring a civil action against the District. For purposes of those provisions, the running of the time within which a claim must be presented to the District shall be tolled from the time the Developer submits its written claim until the time the claim is denied, including any time utilized by any applicable meet and confer process.

61.7. Claim Resolution pursuant to Public Contract Code section 20104 et seq.

61.7.1. In the event of a disagreement between the parties as to performance of the Work, the interpretation of this Contract, or payment or nonpayment for Work performed or not performed, the parties shall attempt to resolve all claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between Contractor and District by those procedures set forth in Public Contract Code section 20104, et seq., to the extent applicable.

61.7.1.1 Developer shall file with the District any written Claim, including the documents necessary to substantiate it, upon the application for final payment.

61.7.1.2 For claims of less than fifty thousand dollars (\$50,000), the District shall respond in writing within forty-five (45) days of receipt of the Claim or may request in writing within thirty (30) days of receipt of the Claim any additional documentation supporting the claim or relating to defenses or claims the District may have against the Developer.

61.7.1.2.1. If additional information is required, it shall be requested and provided by mutual agreement of the parties.

61.7.1.2.2. District's written response to the documented Claim shall be submitted to the Developer within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by the Developer to produce the additional information, whichever is greater.

61.7.1.3 For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the District shall respond in writing to all written Claims within sixty (60) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the Claim any additional documentation supporting the Claim or relating to defenses or claims the District may have against the Developer.

61.7.1.3.1. If additional information is required, it shall be requested and provided upon mutual agreement of the District and the Developer.

61.7.1.3.2. The District's written response to the claim, as further documented, shall be submitted to the Developer within thirty (30) days after receipt of the further documentation, or within a period of time no greater than that taken by the Developer to produce the additional information or requested documentation, whichever is greater.

61.7.1.4 If Developer disputes the District's written response, or the District fails to respond within the time prescribed, Developer may so notify the District, in writing, either within fifteen (15) days of receipt of the District's response or within fifteen (15) days of the District's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

61.7.1.5 Following the meet and confer conference, if the claim or any portion of it remains in dispute, the Developer shall file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions the running of the time within which a claim must be filed shall be tolled from the time the Developer submits its written Claim until the time the Claim is denied, including any period of time utilized by the meet and confer process.

61.7.1.6 For any civil action filed to resolve claims filed pursuant to this section, within sixty (60) days, but no earlier than thirty (30) days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from

the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

61.7.1.7 If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of the Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act, (commencing with Section 2016) of Chapter 1 of Title 4 of part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

61.7.1.8 The District shall not fail to pay money as to any portion of a Claim which is undisputed except as otherwise provided in the Contract Documents. In any suit filed pursuant to this section, the District shall pay interest at the legal rate on any arbitration award or judgment. Interest shall begin to accrue on the date the suit is filed in a court of law.

61.7.2. Developer shall bind its Subcontractors to the provisions of this Section and will hold the District harmless against disputes by Subcontractors.

61.8. Claim Resolution Non-Applicability

61.8.1. The procedures for dispute and claim resolution set forth in this Article shall not apply to the following:

61.8.1.1 Personal injury, wrongful death or property damage claims.

61.8.1.2 Latent defect or breach of warranty or guarantee to repair.

61.8.1.3 Stop payment notices.

61.8.1.4 District's rights set forth in the Article on Suspension and Termination.

61.8.1.5 Disputes arising out of labor compliance enforcement by the Department of Industrial Relations; or

61.8.1.6 District rights and obligations as a public entity set forth in applicable statutes; provided, however, that penalties imposed against a public entity by statutes, including, but not limited to, Public Contract Code sections 20104.50 and 7107, shall be subject to the Claim Resolution requirements provided in this Article.

61.9. Attorney's Fees

Should litigation be necessary to enforce any terms or provisions of this Agreement, then each party shall bear its own litigation and collection expenses, witness fees, court costs and attorney's fees.

62.State Labor, Wage & Hour, Apprentice, And Related Provisions

62.1. Labor Compliance and Enforcement

Since this Project is subject to labor compliance and enforcement by the Department of Industrial Relations ("DIR"), Developer specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code and Title 8 of the California Code of Regulations, including, without limitation, the requirement that the Developer and all Subcontractors shall timely furnish complete and accurate electronic certified payroll records directly to the DIR. The District may not issue payment if this requirement is not met.

62.2. Wage Rates, Travel, and Subsistence

62.2.1. Pursuant to the provisions of Article 2 (commencing at section 1770), Chapter 1, Part 7, Division 2, of the Labor Code of California, the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed to execute the Contract Documents are on file at the District's principal office and copies will be made available to any interested party on request. Developer shall obtain and post a copy of these wage rates at the job site.

62.2.2. Holiday and overtime work, when permitted by law, shall be paid for at a rate of at least one and one-half times the above specified rate of per diem wages, unless otherwise specified. The holidays upon which those rates shall be paid need not be specified by the District, but shall be all holidays recognized in the applicable collective bargaining agreement. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code.

62.2.3. Developer shall pay and shall cause to be paid each worker engaged in Work on the Project not less than the general prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations ("DIR") ("Director"), regardless of any contractual relationship which may be alleged to exist between Developer or any Subcontractor and such workers.

62.2.4. If, prior to execution of the Facilities Lease, the Director determines that there has been a change in any prevailing rate of per diem wages in the locality in which the Work under the Contract Documents is to be performed, such change shall not alter the wage rates in the Contract Documents subsequently awarded.

62.2.5. Pursuant to Labor Code section 1775, Developer shall, as a penalty, forfeit the statutory amount (believed by the District to be currently two hundred dollars (\$200) to District for each calendar day, or portion thereof, for each worker paid less than the prevailing rates, determined by the District and/or the Director, for the work or craft in which that worker is employed for any public work done under Contract by Developer or by any Subcontractor under it. The difference between such prevailing wage rates and the amount

paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate, shall be paid to each worker by Developer.

62.2.6. Any worker employed to perform Work on the Project, which Work is not covered by any classification listed in the general prevailing wage rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to Work to be performed by him, and that minimum wage rate shall be retroactive to time of initial employment of the person in that classification.

62.2.7. Pursuant to Labor Code section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel time, subsistence pay, and apprenticeship or other training programs authorized by Labor Code section 3093, and similar purposes.

62.2.8. Developer shall post at appropriate conspicuous points on the Project Site a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned. In addition, Developer shall post a sign-in log for all workers and visitors to the Site, a list of all Subcontractors of any tier on the Site, and the required Equal Employment Opportunity poster(s).

62.3. Hours of Work

62.3.1. As provided in Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2, of the Labor Code, eight (8) hours of labor shall constitute a legal day of work. The time of service of any worker employed at any time by Developer or by any Subcontractor on any subcontract under the Contract Documents upon the Work or upon any part of the Work contemplated by the Contract Documents shall be limited and restricted by Developer to eight (8) hours per day, and forty (40) hours during any one week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of Developer in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

62.3.2. Developer shall keep and shall cause each Subcontractor to keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by Developer in connection with the Work or any part of the Work contemplated by the Contract Documents. The record shall be kept open at all reasonable hours to the inspection of District and to the Division of Labor Standards Enforcement of the DIR.

62.3.3. Pursuant to Labor Code section 1813, Developer shall, as a penalty, forfeit the statutory amount (believed by the District to be currently twenty-five dollars (\$25)) to the District for each worker employed in the execution of the Contract Documents by Developer or by any Subcontractor for each calendar day during which a worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one

calendar week in violation of the provisions of Article 3 (commencing at section 1810), Chapter 1, Part 7, Division 2, of the Labor Code.

62.3.4. Any Work necessary to be performed after regular working hours, or on Sundays or other holidays shall be performed without additional expense to the District.

62.4. Payroll Records

62.4.1. Developer shall upload, and shall cause each Subcontractor performing any portion of the Work under this Contract to upload, an accurate and complete certified payroll record ("CPR") electronically using DIR's eCPR System by uploading the CPRs by electronic XML file or entering each record manually using the DIR's iform (or current form) online on a weekly basis and within ten (10) days of any request by the District or Labor Commissioner at <http://www.dir.ca.gov/Public-Works/Certified/Payroll-Reporting.html> or current application and URL, showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Developer and/or each Subcontractor in connection with the Work.

62.4.2. The CPRs enumerated hereunder shall be filed directly with the DIR on a weekly basis or to the requesting party, whether the District or DIR, within ten (10) days after receipt of each written request. The CPRs from the Developer and each Subcontractor for each week shall be provided on or before Wednesday of the week following the week covered by the CPRs. District may not make any payment to Developer until:

62.4.2.1 The Developer and/or its Subcontractor(s) provide CPRs acceptable to the District and DIR.

62.4.2.2 Any delay in Developer and/or its Subcontractor(s) providing CPRs to the District or DIR in a timely manner may directly delay the District's review and/or audit of the CPRs and Developer's payment.

62.4.3. All CPRs shall be available for inspection at all reasonable hours at the principal office of Developer on the following basis:

62.4.3.1 A certified copy of an employee's CPR shall be made available for inspection or furnished to the employee or his/her authorized representative on request.

62.4.3.2 CPRs shall be made available for inspection or furnished upon request or as required by regulation to a representative of the District, Division of Labor Standards Enforcement, Division of Apprenticeship Standards, and/or the DIR.

62.4.3.3 CPRs shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through the District, Division of Apprenticeship Standards, or the Division of Labor Standards

Enforcement. If the requested CPRs have not been provided pursuant to the provisions herein, the requesting party shall, prior to being provided the records, reimburse the costs of preparation by Developer, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of Developer.

62.4.4. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by District, Division of Apprenticeship Standards, Division of Labor Standards Enforcement, or DIR shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of Developer awarded the Project under the Contract Documents or performing under the Contract Documents shall not be marked or obliterated.

62.4.5. Developer shall inform District of the location of the records enumerated hereunder, including the street address, city, and county, and shall, within five (5) working days of a change in location of the records, provide a notice of change of location and address.

62.4.6. In the event of noncompliance with the requirements of this section, Developer shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Developer must comply with this section. Should noncompliance still be evident after the ten (10) day period, Developer shall, as a penalty, forfeit up to one hundred dollars (\$100) to District for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Labor Commissioner, these penalties shall be withheld from Tenant Improvement Payments then due.

62.5. [Reserved]

62.6. Apprentices

62.6.1. Developer acknowledges and agrees that, if the Contract Documents involve a dollar amount greater than or a number of working days greater than that specified in Labor Code section 1777.5, then this Contract is governed by the provisions of Labor Code Section 1777.5 and 29 CFR part 5. It shall be the responsibility of Developer to ensure compliance with this Article and with Labor Code section 1777.5 for all apprenticeship occupations.

62.6.2. Apprentices of any crafts or trades may be employed and, when required by Labor Code section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

62.6.3. Every apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only at the work of the craft or trade to which she/he is registered.

62.6.4. Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at section 3070), Division 3, of the

Labor Code, are eligible to be employed. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

62.6.5. Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Developer and any Subcontractors employing workers in any apprenticeable craft or trade in performing any Work under this Contract shall apply to the applicable joint apprenticeship committee for a certificate approving the Developer or Subcontractor under the applicable apprenticeship standards and fixing the ratio of apprentices to journeymen employed in performing the Work.

62.6.6. Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Developer and any Subcontractor may be required to make contributions to the apprenticeship program.

62.6.7. If Developer or Subcontractor willfully fails to comply with Labor Code section 1777.5, then, upon a determination of noncompliance by the Administrator of Apprenticeship, it shall:

62.6.7.1 Be denied the right to bid on any subsequent project for one (1) year from the date of such determination.

62.6.7.2 Forfeit, as a penalty, to District the full amount stated in Labor Code section 1777.7. Interpretation and enforcement of these provisions shall be in accordance with the rules and procedures of the California Apprenticeship Council and under the authority of the Chief of the Division of Apprenticeship Standards.

62.6.7.3 Developer and all Subcontractors shall comply with Labor Code section 1777.6, which section forbids certain discriminatory practices in the employment of apprentices.

62.6.7.4 Developer shall become fully acquainted with the law regarding apprentices prior to commencement of the Work. Special attention is directed to sections 1777.5, 1777.6, and 1777.7 of the Labor Code, and Title 8, California Code of Regulations, Section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, 9th Floor, San Francisco, California 94102.

62.7. Skilled and Trained Workforce

62.7.1. Developer and its subcontractors at every tier hereby provides an enforceable commitment to comply with Public Contract Code section 2600 et seq., which requires use of a skilled and trained workforce to perform all work on the Contract or Project that falls within an apprenticeable occupation in the building and construction trades.

62.7.1.1 "Apprenticeable Occupation" means an occupation for which the Chief of the Division of Apprenticeship Standards of the Department of Industrial Relations ("Chief") had approved an

apprenticeship program pursuant to Section 3075 of the Labor Code before January 1, 2014.

62.7.1.2 "Skilled and Trained Workforce" means a workforce that meets all of the following conditions:

62.7.1.2.1. All of the workers are either skilled journeypersons or apprentices registered in an apprenticeship program approved by the Chief.

62.7.1.2.2 That, for the applicable dates, either (A) the number of the skilled journeypersons employed to perform work on the Contract or Project by the Developer or its subcontractors at every tier are graduates of an apprenticeship program for the applicable occupation that was either approved by the Chief pursuant to Labor Code section 3075 or located outside California and approved for federal purposes pursuant to the apprenticeship regulations adopted by the federal Secretary of Labor, or (B) the hours of work performed by skilled journeypersons who have graduated from an approved apprenticeship program meet at least the percentages set forth in the following chart:

APPLICABLE DATES	% REQUIREMENT
1/1/2016 – 12/31/2017	At least 30%
1/1/2018 – 12/31/2018	At least 40%
1/1/2019 – 12/31/2019	At least 50%
1/1/2020 – 12/31/2020	At least 60%

62.7.1.2.3. For an apprenticeable occupation in which no apprenticeship program has been approved by the Chief before January 1, 1995, up to one-half of the above graduation percentage requirements set forth in the above chart may be satisfied by skilled journeypersons who commenced working in the apprenticeable occupation before the Chief's approval of an apprenticeship program for that occupation in the county in which the Project is located.

62.7.1.2.4. The contractor or subcontractor need not meet the apprenticeship graduation requirements if:

62.7.1.2.4.1. During a calendar month, the Developer or subcontractor employs skilled journeypersons to perform fewer than 10 hours of work on the Contract or Project; or

62.7.1.2.4.2. The subcontractor was not a listed subcontractor under Public Contract Code section 4104 or a substitute for a listed subcontractor, and the subcontract does not exceed one-half of 1 percent (0.5%) of the price of the prime contract.

62.7.1.3 "Skilled Journeyperson" means a worker who either:

62.7.1.3.1. Graduated from an apprenticeship program for the applicable occupation that was approved by the Chief or located outside of California and approved for federal purposes pursuant to the apprenticeship regulations adopted by the federal Secretary of Labor; or

62.7.1.3.2. Has at least as many hours of on-the-job experience in the applicable occupation as would be required to graduate from an apprenticeship program for the applicable occupation that is approved by the Chief.

62.7.2. Developer and its subcontractors will demonstrate its compliance with the Skilled and Trained Workforce requirements by either of the following:

62.7.2.1 Provide monthly reports to the District demonstrating that the Developer and its subcontractors are complying with the requirements of Public Contract Code section 2600 et seq., which shall be a public record under California Public Records Act, Government Code section 6250 et seq.; or

62.7.2.2 Provide evidence that Developer and its subcontractors have agreed to be bound by: (1) a project labor agreement entered into by the District that binds all contractors and all its subcontractors at every tier performing work on the Project to use a skilled and trained workforce; (2) the extension or renewal of a project labor agreement entered into by the District prior to January 1, 2017; or (3) a project labor agreement that binds all contractors and all its subcontractors at every tier performing work on the Project to use a skilled and trained workforce.

62.8. Non-Discrimination

62.8.1. Developer herein agrees not to discriminate in its recruiting, hiring, promotion, demotion, or termination practices on the basis of race, religious creed, national origin, ancestry, sex, sexual orientation, age, or physical handicap in the performance of this Contract and to comply with the provisions of the California Fair Employment and Housing Act as set forth in Part 2.8 of Division 3 of Title 2 of the California Government Code, commencing at section 12900; the Federal Civil Rights Act of 1964, as set forth in Public Law 88-352, and all amendments thereto; Executive Order 11246; and all administrative rules and regulations found to be applicable to Developer and Subcontractor.

62.8.2. Special requirements for Federally Assisted Construction Contracts: During the performance of the requirement of the Contract Documents, Developer agrees to incorporate in all subcontracts the provisions set forth in Chapter 60-1.4(b) of Title 41 published in Volume 33 No. 104 of the Federal Register dated May 28, 1968.

62.9. Labor First Aid

Developer shall maintain emergency first aid treatment for Developer's laborers and mechanics on the Project which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.) and the California Occupational Safety and Health Act of 1973 (Lab. Code, § 6300 et seq.; 8 Cal. Code of Regs., § 330 et seq.).

63. [Reserved]

64. Miscellaneous

64.1. Assignment of Antitrust Actions

Although this project may not have been formally bid, the following provisions may apply:

64.1.1. Section 7103.5(b) of the Public Contract Code states:

In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties.

64.1.2. Section 4552 of the Government Code states in pertinent part:

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

64.1.3. Section 4553 of the Government Code states in pertinent part:

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to

overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

64.1.4. Section 4554 of the Government Code states in pertinent part:

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

64.1.5. Under this Article, "public purchasing body" is District and "bidder" is Developer.

64.2. Excise Taxes

If, under Federal Excise Tax Law, any transaction hereunder constitutes a sale on which a Federal Excise Tax is imposed and the sale is exempt from such Federal Excise Tax because it is a sale to a State or Local Government for its exclusive use, District, upon request, will execute documents necessary to show (1) that District is a political subdivision of the State for the purposes of such exemption, and (2) that the sale is for the exclusive use of District. No Federal Excise Tax for such materials shall be included in any Guaranteed Maximum Price.

64.3. Taxes

Guaranteed Maximum Price is to include any and all applicable sales taxes or other taxes that may be due in accordance with section 7051 et seq. of the Revenue and Taxation Code, Regulation 1521 of the State Board of Equalization or any other tax code that may be applicable.

64.4. Shipments

All shipments must be F.O.B. destination to Site or approved sites, as indicated in the Contract Documents. There must be no charge for containers, packing, unpacking, drayage, or insurance. The total Guaranteed Maximum Price shall be all inclusive (including sales tax) and no additional costs of any type will be considered.

64.5. Compliance with Government Reporting Requirements

If this Contract is subject to federal or other governmental reporting requirements because of federal or other governmental financing in whole or in part for the Project of which it is part, or for any other reason, Developer shall comply with those reporting requirements at the request of the District at no additional cost.

[END OF DOCUMENT]

EXHIBIT D-1

SPECIAL CONDITIONS

Attached are the special terms and conditions for the Project.

EXHIBIT D-1

SPECIAL CONDITIONS

1. Mitigation Measures

Developer shall comply with all applicable mitigation measures, as follows, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code section 21000 et seq.), including without limitation any Mitigation Monitoring and Reporting Program prepared in connection therewith, attached to this exhibit as Attachment 1, and its terms incorporated herein.

2. Permits, Certificates, Licenses, Fees, Approvals

2.1. Payment for Permits, Certificates, Licenses, Fees, Approvals.

As required in the General Construction Provisions, the Developer shall secure and pay for all permits, licenses, assessments, and certificates necessary for the prosecution of the Work with the exception of the following:

2.1.1. Marin Sanitary Sewer Connection Fees

With respect to the above listed items, Developer shall be responsible for securing such items; however, District will be responsible for payment of these charges or fees. Developer shall notify the District of the amount due with respect to these items and to whom the amount is payable. Developer shall provide the District with an invoice and receipt with respect to such charges or fees.

3. Disabled Veterans Business Enterprise

This Project uses or may plan to use funds allocated pursuant to the State of California School Facility Program for the construction and/or modernization of school buildings. Therefore, Section 17076.11 of the Education Code requires the District to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%), per year, of the overall dollar amount expended each year by the District on projects that receive state funding and the Developer must submit the Disabled Veteran Business Enterprise Participation Certification to the District with its executed Agreement, identifying the steps Developer took to solicit DVBE participation in conjunction with this Contract.

4. Modernization Projects

5.1 Access.

Access to the Project site must be coordinated with District and onsite District personnel before Work is to start. Unless agreed to otherwise in writing, only a school custodian will be allowed to unlock and lock doors in existing building(s). The custodian will be available only while school is in session. If a custodian is required to arrive before 7:00 a.m. or leave after 3:30 p.m. to accommodate Developer's Work, the overtime wages for the custodian will be paid by the Developer, unless at the discretion of the District, other arrangements are made in advance.

5.2 Master Key.

Upon request, the District may, at its own discretion, provide a master key to the school site for the convenience of the Developer. The Developer agrees to pay all expenses to re-key the entire school site and all other affected District buildings if the master key is lost or stolen, or if any unauthorized party obtains a copy of the key or access to the school.

5.3 Maintaining Services.

The Developer is advised that Work is to be performed in spaces regularly scheduled for instruction. Interruption and/or periods of shutdown of public access, electrical service, water service, lighting, or other utilities shall be only as arranged in advance with the District. Developer shall provide temporary services to all facilities interrupted by Developer's Work.

5.4 Maintaining Utilities.

The Developer shall maintain in operation during duration of Contract, drainage lines, storm drains, sewers, water, gas, electrical, steam, and other utility service lines within working area.

5.5 Confidentiality.

Developer shall maintain the confidentiality of all information, documents, programs, procedures and all other items that Developer encounters while performing the Work. This requirement shall be ongoing and shall survive the expiration or termination of this Contract and specifically includes, without limitation, all student, parent, and employee disciplinary information and health information.

5.6 Work during Instructional Time.

Developer affirms that Work may be performed during ongoing instruction in existing facilities. If so, Developer agrees to cooperate to the best of its ability to minimize any disruption to school operations and any use of school facilities by the public up to, and including, rescheduling specific work activities, at no additional cost to District.

4.1. No Work during Student Testing.

Unless previously authorized in writing by District, Developer shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State or Federally-required tests. District shall provide to Developer the District's academic schedule for each applicable academic year, once the schedule(s) become available. Once testing dates are made available, Developer will update their Construction Schedule, incorporating any potential impacts from the testing dates.

5. Substitution for Specified Items

- 5.1.** Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Developer may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified.
 - 5.1.1.** If the material, process, or article offered by Developer is not, in the opinion of the District, substantially equal or better in every respect to that specified, then Developer shall furnish the material, process, or article specified in the Specifications without any additional compensation or change order.
 - 5.1.2.** This provision shall not be applicable with respect to any material, product, thing or service for which District made findings and gave notice in accordance with Public Contract Code section 3400(c); therefore, Developer shall not be entitled to request a substitution with respect to those materials, products or services.
- 5.2.** A request for a substitution shall be submitted as follows:
 - 5.2.1.** Developer shall notify the District in writing of any request for a substitution at least ten (10) days prior to bid opening as indicated in the Instructions to Bidders.
 - 5.2.2.** Requests for Substitutions after award of the Contract shall be submitted within thirty-five (35) days of the date of the Notice of Award.
- 5.3.** Within 35 days after the date of the Notice of Award, Developer shall provide data substantiating a request for substitution of "an equal" item, including but not limited to the following:
 - 5.3.1.** All variations of the proposed substitute from the material specified including, but not limited to, principles of operation, materials, or construction finish, thickness or gauge of materials, dimensions, weight, and tolerances;
 - 5.3.2.** Available maintenance, repair or replacement services;

amounts owing to the Developer for the review of the request for substitution, even if the request for substitution is not approved. District, at its sole discretion, shall deduct from the payments due to and/or invoice Developer for all the professional services and/or DSA fees or delay to the Project Schedule, if applicable, while DSA reviews changes for the convenience of Developer and/or to accommodate Developer's means and methods arising herein.

6. Termination

6.1. Emergency Termination Pursuant to Public Contracts Act of 1949

6.1.1. This Facilities Lease is subject to termination as provided by sections 4410 and 4411 of the Government Code of the State of California, being a portion of the Emergency Termination of Public Contracts Act of 1949.

6.1.1.1. Section 4410 of the Government Code states:

In the event a national emergency occurs, and public work, being performed by contract, is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment or labor, as the result of an order or a proclamation of the President of the United States, or of an order of any federal authority, and the circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the work, then the public agency and the contractor may, by written agreement, terminate said contract.

6.1.1.2. Section 4411 of the Government Code states:

Such an agreement shall include the terms and conditions of the termination of the contract and provision for the payment of compensation or money, if any, which either party shall pay to the other or any other person, under the facts and circumstances in the case.

6.1.2. Compensation to the Developer shall be determined at the sole discretion of District on the basis of the reasonable value of the Work done, including preparatory work. As an exception to the foregoing and at the District's discretion, in the case of any fully completed separate item or portion of the Work for which there is a separate previously submitted unit price or item on the accepted schedule of values, that price may control. The District, at its sole discretion, may adopt the Schedule of Values Price as the value of the work done or any portion thereof.

EXHIBIT E

MEMORANDUM OF COMMENCEMENT DATE

This MEMORANDUM OF COMMENCEMENT DATE is dated _____, and is made by and between BHM Construction, Inc. ("Developer"), as Lessor, and the San Rafael City Schools ("District"), as Lessee.

1. Developer and District have previously entered into a Facilities Lease dated as of _____, 201__, (the "Lease") for the leasing by Developer to District of the Project Site and Project in [City], California, referenced in the Lease.

2. District hereby confirms the following:

A. That all construction of the Project required to be performed pursuant to the Facilities Lease has been completed by Developer in all respects;

B. That District has accepted and entered into possession of the Project and now occupies same; and

C. That the term for the Lease Payments under the Facilities Lease commenced on _____, 201__ and will expire at 11:59 P.M. on _____, 20__.

THIS MEMORANDUM OF COMMENCEMENT DATE IS ACCEPTED AND AGREED on the date indicated below:

Dated: _____, 201__

Dated: _____, 201__

San Rafael City Schools

BHM Construction, Inc.

By: _____

By: _____

Name: Michael Watenpaugh

Name: Jeffrey Mazet

Title: Superintendent

Title: President

EXHIBIT F

CONSTRUCTION SCHEDULE

Attached is a detailed Project Construction Schedule with a duration no longer than the Contract Time, and with specific milestones that Developer shall meet.

[To Be Attached.]

EXHIBIT G

SCHEDULE OF VALUES

Attached is a detailed Schedule of Values that complies with the requirements of the Construction Provisions (Exhibit "D") and that has been approved by the District.

[To Be Attached.]

DOCUMENT 00 55 00

NOTICE TO PROCEED

Dated: _____, 2019

TO: BHM Construction, Inc.
("Contractor")

ADDRESS: 221 Gateway Road W #405, Napa, CA 94558.

PROJECT: Terra Linda High School – New Commons, Kitchen, Library, Drama, Music, and Classroom Building Project.

PROJECT/CONTRACT NO.: _____ between the San Rafael City Schools and Contractor ("Contract").

You are notified that the Contract Time under the above Contract will commence to run on _____, 2019. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement executed by Contractor, the date of completion is _____, 20__.

You must submit the following documents by 5:00 p.m. of the TENTH (10th) calendar day following the date of this Notice to Proceed:

- a. Contractor's preliminary schedule of construction.
- b. Contractor's preliminary schedule of values for all of the Work.
- c. Contractor's preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals
- d. Contractor's Safety Plan specifically adapted for the Project.
- e. Registered Subcontractor's List: A complete subcontractors list, including the name, address, telephone number, e-mail address, facsimile number, California State Contractors License number, license classification, Department of Industrial Relations registration number, and monetary value of all Subcontracts.

Thank you. We look forward to a very successful Project.

SAN RAFAEL CITY SCHOOLS

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

04/02/19

ESCROW BID DOCUMENTATION

1. REQUIREMENT TO ESCROW BID DOCUMENTATION

- a. Contractor shall submit, within **SEVEN (7)** calendar days after the date of the Notice of Award, one copy of all documentary information received or generated by Contractor in preparation of bid prices for this Contract, as specified herein. This material is referred to herein as "Escrow Bid Documentation." The Escrow Bid Documentation of the Contractor will be held in escrow for the duration of the Contract.
- b. Contractor agrees, as a condition of award of the Contract, that the Escrow Bid Documentation constitutes all written information used in the preparation of its bid, and that no other written bid preparation information shall be considered in resolving disputes or claims. Contractor also agrees that nothing in the Escrow Bid Documentation shall change or modify the terms or conditions of the Contract Documents.
- c. The Escrow Bid Documentation will not be opened by District except as indicated herein. The Escrow Bid Documentation will be used only for the resolution of change orders and claims disputes.
- d. Contractor's submission of the Escrow Bid Documentation, as with the bonds and insurance documents required, is considered an essential part of the Contract award. Should the Contractor fail to make the submission within the allowed time specified above, District may deem the Contractor to have failed to enter into the Contract, and the Contractor shall forfeit the amount of its bid security, accompanying the Contractor's bid, and District may award the Contract to the next lowest responsive responsible bidder.
- e. NO PAYMENTS WILL BE MADE, NOR WILL DISTRICT ACCEPT PROPOSED CHANGE ORDERS UNTIL THE ABOVE REQUIRED INFORMATION IS SUBMITTED AND APPROVED.
- f. The Escrow Bid Documentation shall be submitted in person by an authorized representative of the Contractor to the District.

2. OWNERSHIP OF ESCROW BID DOCUMENTATION

- a. The Escrow Bid Documentation is, and shall always remain, the property of Contractor, subject to review by District, as provided herein.
- b. Escrow Bid Documentation constitute trade secrets, not known outside Contractor's business, known only to a limited extent and only by a limited number of employees of Contractor, safeguarded while in Contractor's possession, extremely valuable to Contractor, and could be extremely valuable to Contractor's competitors by virtue of it reflecting Contractor's contemplated techniques of construction. Subject to the provisions herein, District agrees to safeguard the Escrow Bid Documentation, and all information contained therein, against disclosure to the fullest extent permitted by law.

3. FORMAT AND CONTENTS OF ESCROW BID DOCUMENTATION

- a. Contractor may submit Escrow Bid Documentation in its usual cost-estimating format; a standard format is not required. The Escrow Bid Documentation shall be submitted in the language (e.g., English) of the specification.

- b. Escrow Bid Documentation must clearly itemize the estimated costs of performing the work of each bid item contained in the bid schedule, separating bid items into sub-items as required to present a detailed cost estimate and allow a detailed cost review. The Escrow Bid Documentation shall include all subcontractor bids or quotes, supplier bids or quotes, quantity takeoffs, crews, equipment, calculations of rates of production and progress, copies of quotes from subcontractors and suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by the Contractor to arrive at the prices contained in the bid proposal. Estimated costs should be broken down into Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and subcontract costs as appropriate. Plant and equipment and indirect costs should be detailed in the Contractor's usual format. The Contractor's allocation of indirect costs, contingencies, markup, and other items to each bid item shall be identified.
- c. All costs shall be identified. For bid items amounting to less than \$10,000, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.
- d. Bid Documentation provided by District should not be included in the Escrow Bid Documentation unless needed to comply with the following requirements.

4. SUBMITTAL OF ESCROW BID DOCUMENTATION

- a. The Escrow Bid Documentation shall be submitted by the Contractor in a sealed container within **SEVEN (7)** calendar days after the date of the Notice of Award. The container shall be clearly marked on the outside with the Contractor's name, date of submittal, project name and the words "Escrow Bid Documentation – Intended to be opened in the presence of Authorized Representatives of Both District and Contractor".
- b. By submitting Escrow Bid Documentation, Contractor represents that the material in the Escrow Bid Documentation constitutes all the documentary information used in preparation of the bid and that the Contractor has personally examined the contents of the Escrow Bid Documentation container and has found that the documents in the container are complete.
- c. If Contractor's proposal is based upon subcontracting any part of the work, each subcontractor whose total subcontract price exceeds 5 percent of the total contract price proposed by Contractor, shall provide separate Escrow Documents to be included with those of Contractor. Those documents shall be opened and examined in the same manner and at the same time as the examination described above for Contractor.
- d. If Contractor wishes to subcontract any portion of the Work after award, District retains the right to require Contractor to submit Escrow Documents for the Subcontractor before the subcontract is approved.

5. STORAGE, EXAMINATION AND FINAL DISPOSITION OF ESCROW BID DOCUMENTATION

- a. The Escrow Bid Documentation will be placed in escrow, for the life of the Contract, in a mutually agreeable institution. The cost of storage will be paid by Contractor for the duration of the project until final Contract payment. The storage facilities shall be the appropriate size for all the Escrow Bid Documentation and located conveniently to both District's and Contractor's offices.

- b. The Escrow Bid Documentation shall be examined by both District and Contractor, at any time deemed necessary by either District or Contractor, to assist in the negotiation of price adjustments and change orders or the settlement of disputes and claims. In the case of legal proceedings, Escrow Bid Documentation shall be used subject to the terms of an appropriate protective order if requested by Contractor and ordered by a court of competent jurisdiction. Examination of the Escrow Bid Documentation is subject to the following conditions:
- (1) As trade secrets, the Escrow Bid Documentation is proprietary and confidential to the extent allowed by law.
 - (2) District and Contractor shall each designate, in writing to the other party **SEVEN (7)** calendar days prior to any examination, the names of representatives who are authorized to examine the Escrow Bid Documentation. No other person shall have access to the Escrow Bid Documentation.
 - (3) Access to the documents may take place only in the presence of duly designated representatives of the District and Contractor. If Contractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days notice, then the District representative may examine the Escrow Bid Documents alone upon an additional **THREE (3)** calendar days notice if a representative of the Contractor does not appear at the time set.
 - (4) If a subcontractor has submitted sealed information to be included in the Escrow Bid Documents, access to those documents may take place only in the presence of a duly designated representative of the District, Contractor and that subcontractor. If that subcontractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days notice, then the District representative and/or the Contractor may examine the Escrow Bid Documentation without that subcontractor present upon an additional **THREE (3)** calendar days notice if a representative of that subcontractor does not appear at the time set.
- c. The Escrow Bid Documentation will be returned to Contractor at such time as the Contract has been completed and final settlement has been achieved.

END OF DOCUMENT

08/27/18

**ESCROW AGREEMENT IN LIEU OF RETENTION
(Public Contract Code Section 22300)**

(Note: Contractor must use this form.)

This Escrow Agreement ("Escrow Agreement") is made and entered into this _____ day of _____, 20____, by and between the San Rafael City Schools ("District"), whose address is 310 Nova Albion Way, San Rafael, California 94903, and _____ ("Contractor"), whose address is _____, and _____ ("Escrow Agent"), a state or federally chartered bank in the state of California, whose address is _____

For the consideration hereinafter set forth, District, Contractor, and Escrow Agent agree as follows:

1. Pursuant to section 22300 of Public Contract Code of the State of California, which is hereby incorporated by reference, Contractor has the following two (2) options:

- ☐ Deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by District pursuant to the Construction Contract No.____ entered into between District and Contractor for the Glenwood Elementary School – Multipurpose Building Project, in the amount of _____ Dollars (\$_____) dated, _____, 20____, (the "Contract"); **or**
- ☐ On written request of Contractor, District shall make payments of the retention earnings for the above referenced Contract directly to Escrow Agent.

When Contractor deposits the securities as a substitute for Contract earnings (first option), Escrow Agent shall notify District within ten (10) calendar days of the deposit. The market value of the securities at the time of substitution and at all times from substitution until the termination of the Escrow Agreement shall be at least equal to the cash amount then required to be withheld as retention under terms of Contract between District and Contractor.

Securities shall be held in the name of San Rafael City Schools School District, and shall designate Contractor as beneficial owner.

2. District shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments pursuant to Contract provisions, provided that Escrow Agent holds securities in form and amount specified above.
3. When District makes payment of retention earned directly to Escrow Agent, Escrow Agent shall hold them for the benefit of Contractor until the time that the escrow created under this Escrow Agreement is terminated. Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow Agreement and the rights and responsibilities of the Parties shall be equally applicable and binding when District pays Escrow Agent directly.
4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses of District. The District will charge Contractor \$_____ for each of District's deposits to the escrow account. These expenses and payment terms shall be determined by District, Contractor, and Escrow Agent.

5. Interest earned on securities or money market accounts held in escrow and all interest earned on that interest shall be for sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to District.
6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from District to Escrow Agent that District consents to withdrawal of amount sought to be withdrawn by Contractor.
7. District shall have the right to draw upon the securities and/or withdraw amounts from the Escrow Account in the event of default by Contractor. Upon seven (7) days' written notice to Escrow Agent from District of the default, if applicable, Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by District.
8. Upon receipt of written notification from District certifying that the Contract is final and complete, and that Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all monies and securities on deposit and payments of fees and charges.
9. Escrow Agent shall rely on written notifications from District and Contractor pursuant to Paragraphs 5 through 8, inclusive, of this Escrow Agreement and District and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of securities and interest as set forth above.
10. Names of persons who are authorized to give written notice or to receive written notice on behalf of District and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of District:

Title

Name

Signature

Address

On behalf of Contractor:

Title

Name

Signature

Address

On behalf of Escrow Agent:

Title

Name

Signature

Address

At the time that the Escrow Account is opened, District and Contractor shall deliver to Escrow Agent a fully executed copy of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

On behalf of District:

On behalf of Contractor:

Title

Title

Name

Name

Signature

Signature

Address

Address

END OF DOCUMENT

08/27/18

**PERFORMANCE BOND
(100% of Contract Price)**

(Note: Contractor must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the San Rafael City Schools, ("District") and _____ ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

Terra Linda High School – Student Commons

("Project" or "Contract") which Contract dated _____, 20____, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof; and

WHEREAS, said Principal is required under the terms of the Contract to furnish a bond for the faithful performance of the Contract.

NOW, THEREFORE, the Principal and _____ ("Surety") are held and firmly bound unto the Board of the District in the penal sum of

Dollars (\$_____), lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents, to:

- Promptly perform all the work required to complete the Project; and
- Pay to the District all damages the District incurs as a result of the Principal's failure to perform all the Work required to complete the Project.

Or, at the District's sole discretion and election, the Surety shall obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the District of the lowest responsible bidder, arrange for a contract between such bidder and the District and make available as Work progresses sufficient funds to pay the cost of completion less the "balance of the Contract Price," and to pay and perform all obligations of Principals under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages. The term "balance of the Contract Price," as used in this paragraph, shall mean the total amount payable to Principal by the District under the Contract and any modifications thereto, less the amount previously paid by the District to the Principal, less any withholdings by the District allowed under the Contract. District shall not be required or obligated to accept a tender of a completion contractor from the Surety for any or no reason.

The condition of the obligation is such that, if the above bound Principal, its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in the Contract and any alteration thereof made as therein provided, on its part to be kept and performed at the time and in the intent and meaning, including all contractual guarantees and warranties of materials and workmanship, and shall indemnify and save harmless the District, its trustees, officers and agents, as therein stipulated, then this obligation shall become null and void, otherwise it shall be and remain in full force and virtue.

Surety expressly agrees that the District may reject any contractor or subcontractor proposed by Surety to fulfill its obligations in the event of default by the Principal. Surety shall not utilize Principal in completing the Work nor shall Surety accept a Bid from Principal for completion of the Work if the District declares the Principal to be in default and notifies Surety of the District's objection to Principal's further participation in the completion of the Work.

As a condition precedent to the satisfactory completion of the Contract, the above obligation shall hold good for a period equal to the warranty and/or guarantee period of the Contract, during which time Surety's obligation shall continue if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the District from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the District's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure section 337.15.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond. The Surety also stipulates and agrees that it shall not be exonerated or released from the obligation of this bond by any overpayment or underpayment by the District that is based upon estimates approved by the Architect. The Surety does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the work or to the specifications.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the _____ day of _____, 20____.

Principal	Surety
By	By
	Name of California Agent of Surety
	Address of California Agent of Surety
	Telephone No. of California Agent of Surety

Contractor must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT

08/27/18

**PAYMENT BOND
Contractor's Labor & Material Bond
(100% Of Contract Price)**

(Note: Contractor must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the San Rafael City Schools, ("District") and _____, ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

Terra Linda High School – Student Commons

("Project" or "Contract") which Contract dated _____, 20____, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof; and

WHEREAS, pursuant to law and the Contract, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by which the Contract is awarded in an amount equal to one hundred percent (100%) of the Contract price, to secure the claims to which reference is made in sections 9000 through 9510 and 9550 through 9566 of the Civil Code, and division 2, part 7, of the Labor Code.

NOW, THEREFORE, the Principal and _____ ("Surety") are held and firmly bound unto all laborers, material men, and other persons referred to in said statutes in the sum of _____ Dollars (\$ _____), lawful money of the United States, being a sum not less than the total amount payable by the terms of Contract, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the Principal or any of its subcontractors, or their heirs, executors, administrators, successors, or assigns of any, all, or either of them shall fail to pay for any labor, materials, provisions, or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal or any of his or its subcontractors of any tier under Section 13020 of the Unemployment Insurance Code with respect to such work or labor, that the Surety will pay the same in an amount not exceeding the amount herein above set forth, and also in case suit is brought upon this bond, will pay a reasonable attorney's fee to be awarded and fixed by the court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under section 9100 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void; otherwise it shall be and remain in full force and affect.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of Contract or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the _____ day of _____, 20____.

Principal	Surety
By	By
	Name of California Agent of Surety
	Address of California Agent of Surety
	Telephone No. of California Agent of Surety

Contractor must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT

08/27/18

ALLOWANCE EXPENDITURE DIRECTIVE FORM

San Rafael City Schools
310 Nova Albion Way
San Rafael, CA 94903

**ALLOWANCE EXPENDITURE
DIRECTIVE NO.:**

ALLOWANCE EXPENDITURE DIRECTIVE

Project: Terra Linda High School – Student Commons

Date: _____

DSA File No.: 21-H1

DSA Appl. No. 01-117738

Bid No.: _____

The following parties agree to the terms of this Allowance Expenditure Directive ("AED"):

Owner Name, Address, Telephone:

Contractor Name, Address, Telephone:

Reference	Description	Allowance Authorized for Expenditure	Days Ext.
Request for AED # Requested by: Performed by: Reason:	[Description of unforeseen item relating to Work] [Requester] [Performer] [Reason]	\$	
Request for AED # Requested by: Performed by: Reason:	[Description of unforeseen item relating to Work] [Requester] [Performer] [Reason]	\$	
Request for AED # Requested by: Performed by: Reason:	[Description of unforeseen item relating to Work] [Requester] [Performer] [Reason]	\$	

Contract time will be adjusted as follows:	Total Contract Allowance Amount:	\$
Previous Completion Date: <u> [DATE] </u>	Amount of Previously Approved Allowance Expenditure Directive(s):	\$
<u> [#] </u> Calendar Days Extension (zero days unless otherwise indicated)	Amount of this Allowance Expenditure Directive:	\$
Current Completion Date: <u> [DATE] </u>		

The undersigned Contractor approves the foregoing release of allowance for completion of each specified item, and as to the extension of time allowed, if any, for completion of the entire work as stated therein, and agrees to furnish all labor, materials and services and perform all work necessary to complete any additional work specified for the consideration stated therein ("Work"). Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650, et seq.

This Allowance Expenditure Directive must be signed by an authorized District representative.

It is expressly understood that the authorized allowance expenditure and time, if any, granted herein represent a full accord and satisfaction for any and all time and cost impacts of the items herein, and Contractor waives any and all further compensation or time extension based on the items herein. The value of the extra work or changes expressly includes any and all of the Contractor's costs and expenses, and its subcontractors, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project. Any costs, expenses, damages or time extensions not included are deemed waived.

Signatures:

DISTRICT: _____ SCHOOL DISTRICT Date: _____ By: _____ [Print Name and Title here]	CONTRACTOR: _____ Date: _____ By: _____ [Print Name and Title here]
ARCHITECT: _____ Date: _____ By: _____ [Print Name and Title here]	PROJECT INSPECTOR: _____ Date: _____ By: _____ [Print Name and Title here]

END OF DOCUMENT

08/27/18

PROPOSED CHANGE ORDER FORM

San Rafael City Schools
310 Nova Albion Way
San Rafael, CA 94903

PCO NO.:

Project: Terra Linda High School – Student Commons
Bid No.:
RFI #:

Date:
DSA File No.: 21-H1
DSA Appl. No.: 01-117738

Contractor hereby submits for District's review and evaluation this Proposed Change Order ("PCO"), submitted in accordance with and subject to the terms of the Contract Documents, including Sections 17.7 and 17.8 of the General Conditions. Any spaces left blank below are deemed no change to cost or time.

Contractor understands and acknowledges that documentation supporting Contractor's PCO must be attached and included for District review and evaluation. Contractor further understands and acknowledges that failure to include documentation sufficient to, in District's discretion, support some or all of the PCO, shall result in a rejected PCO.

	WORK PERFORMED OTHER THAN BY CONTRACTOR	ADD	DEDUCT
(a)	<u>Material</u> (attach suppliers' invoice or itemized quantity and unit cost plus sales tax)		
(b)	<u>Add Labor</u> (attach itemized hours and rates, fully encumbered)		
(c)	<u>Add Equipment</u> (attach suppliers' invoice)		
(d)	<u>Subtotal</u>		
(e)	<u>Add overhead and profit for any and all tiers of Subcontractor</u> , the total not to exceed ten percent (10%) of Item (d)		
(f)	<u>Subtotal</u>		
(g)	<u>Add Overhead and Profit for Contractor</u> , not to exceed five percent (5%) of Item (f)		
(h)	<u>Subtotal</u>		
(i)	<u>Add Bond and Insurance</u> , not to exceed one and a half percent (1.5%) of Item (h)		
(j)	<u>TOTAL</u>		
(k)	<u>Time</u> (zero unless indicated; "TBD" not permitted)	Calendar Days	

[REMAINDER OF PAGE LEFT BLANK INTENTIONALLY]

	WORK PERFORMED BY CONTRACTOR	ADD	DEDUCT
(a)	Material (attach itemized quantity and unit cost plus sales tax)		
(b)	Add Labor (attach itemized hours and rates, fully encumbered)		
(c)	Add Equipment (attach suppliers' invoice)		
(d)	Subtotal		
(e)	Add Overhead and Profit for Contractor , not to exceed fifteen percent (15%) of Item (d)		
(f)	Subtotal		
(g)	Add Bond and Insurance , not to exceed one and a half percent (1.5%) of Item (f)		
(h)	TOTAL		
(i)	Time (zero unless indicated; "TBD" not permitted)	Calendar Days	

The undersigned Contractor approves the foregoing as to the changes, if any, to the Contract Price specified for each item, and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 *et seq.* It is understood that the changes herein to the Contract shall only be effective when approved by the governing board of the District.

It is expressly understood that the value of the extra Work or changes expressly includes any and all of the Contractor's costs and expenses, direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Contractor is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

SUBMITTED BY:

Contractor:

[Name]

Date

END OF DOCUMENT

08/27/18

CHANGE ORDER FORM

San Rafael City Schools
310 Nova Albion Way
San Rafael, CA 94903

CHANGE ORDER NO.:

CHANGE ORDER

Project: Terra Linda High School – Student Commons
Bid No.:

Date:
DSA File No.: 21-H1
DSA Appl. No.: 01-117738

The following parties agree to the terms of this Change Order:

Owner: [Name / Address] **Contractor:** [Name / Address]
Architect: [Name / Address] **Project Inspector:** [Name / Address]

Reference	Description	Cost	Days Ext.
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
Contract time will be adjusted as follows:		Original Contract Amount:	\$
Previous Completion Date: <u> [Date] </u>		Amount of Previously Approved Change Order(s):	\$
<u> </u> [#] Calendar Days Extension (zero unless otherwise indicated)		Amount of this Change Order:	\$
Current Completion Date: <u> [Date] </u>		Contract Amount:	\$

The undersigned Contractor approves the foregoing as to the changes, if any, to the Contract Price specified for each item, and as to the extension of time allowed, if any, for completion of the entire

work as stated therein, and agrees to furnish all labor, materials and services and perform all work necessary to complete any additional work specified for the consideration stated therein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650, *et seq.*

This change order is subject to approval by the governing board of this District and must be signed by the District. Until such time as this change order is approved by the District's governing board and executed by a duly authorized District representative, this change order is not effective and not binding.

It is expressly understood that the compensation and time, if any, granted herein represent a full accord and satisfaction for any and all time and cost impacts of the items herein, and Contractor waives any and all further compensation or time extension based on the items herein. The value of the extra work or changes expressly includes any and all of the Contractors costs and expenses, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project. Any costs, expenses, damages or time extensions not included are deemed waived.

Signatures:

District:

Contractor:

[Name] Date

[Name] Date

Architect:

Project Inspector:

[Name] Date

[Name] Date

END OF DOCUMENT

08/27/18

AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS

THIS AGREEMENT AND RELEASE OF CLAIMS ("Agreement and Release") IS MADE AND ENTERED INTO THIS _____ DAY OF _____, 20____ by and between the SAN RAFAEL CITY SCHOOLS ("District") and _____ ("Contractor"), whose place of business is _____.

RECITALS:

1. District and Contractor entered into PROJECT/CONTRACT NO.: _____ ("Contract" or "Project") in the County of _____, California.
2. The Work under the Contract was completed on _____, and a Notice of Completion was recorded with the County Recorder on _____ [A1].

NOW, THEREFORE, it is mutually agreed between District and Contractor as follows:

AGREEMENT AND RELEASE

3. Contractor will only be assessed liquidated damages as detailed below:

Original Contract Sum \$ _____

Modified Contract Sum \$ _____

Payment to Date \$ _____

Liquidated Damages \$ _____

Payment Due Contractor \$ _____
4. Subject to the provisions hereof, District shall forthwith pay to Contractor the undisputed sum of _____ Dollars (\$ _____) under the Contract, less any amounts represented by any notice to withhold funds on file with District as of the date of such payment.
5. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against District arising from the performance of work under the Contract, except for the claims described in Paragraph 6 and continuing obligations described in Paragraph 8. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against District and all of its respective agents, employees, trustees, inspectors, assignees, consultants and transferees, except for any Disputed Claim that may be set forth in Paragraph 6 and the continuing obligations described in Paragraph 8 hereof.

6. The following claims are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

<u>Claim No.</u>	<u>Description of Claim</u>	<u>Amount of Claim</u>	<u>Date Claim</u>
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____

[If further space is required, attach additional sheets showing the required information.]

7. Consistent with California Public Contract Code section 7100, Contractor hereby agrees that, in consideration of the payment set forth in Paragraph 4 hereof, Contractor hereby releases and forever discharges District, all its agents, employees, inspectors, assignees, and transferees from any and all liability, claims, demands, actions, or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.
8. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.
9. To the furthest extent permitted by California law, Contractor shall defend, indemnify, and hold harmless the District, its agents, representatives, officers, consultants, employees, trustees, and volunteers (the "indemnified parties") from any and all losses, liabilities, claims, suits, and actions of any kind, nature, and description, including, but not limited to, attorneys' fees and costs, directly or indirectly arising out of, connected with, or resulting from the performance of the Contract unless caused wholly by the sole negligence or willful misconduct of the District.
10. Contractor hereby waives the provisions of California Civil Code section 1542 which provides as follows:
- A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.
11. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable. If any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal, or other law, ruling, or regulations, then such provision, or part thereof, shall remain in force and effect to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.
12. All rights of District shall survive completion of the Work or termination of Contract, and execution of this Release.

* * * CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING * * *

SAN RAFAEL CITY SCHOOLS

Signature: _____

Print Name: _____

Title: _____

CONTRACTOR: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

08/27/18

DOCUMENT 00 65 36

GUARANTEE FORM

_____ ("Contractor") hereby agrees that the _____
_____ ("Work" of Contractor) which Contractor has installed for the San Rafael City Schools
("District") for the following project:

PROJECT: Terra Linda High School – Student Commons

("Project" or "Contract") has been performed in accordance with the requirements of the Contract Documents and that the Work as installed will fulfill the requirements of the Contract Documents.

The undersigned agrees to repair or replace any or all of such Work that may prove to be defective in workmanship or material together with any other adjacent Work that may be displaced in connection with such replacement within a period of _____ year(s) from the date of completion as defined in Public Contract Code section 7107, subdivision (c), ordinary wear and tear and unusual abuse or neglect excepted. The date of completion is _____, 20____.

In the event of the undersigned's failure to comply with the above-mentioned conditions within a reasonable period of time, as determined by the District, but not later than seven (7) days after being notified in writing by the District, the undersigned authorizes the District to proceed to have said defects repaired and made good at the expense of the undersigned. The undersigned shall pay the costs and charges therefor upon demand.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

Representatives to be contacted for service subject to terms of Contract:

Name: _____

Address: _____

Phone No.: _____

END OF DOCUMENT

08/27/18

DOCUMENT 00 72 13

GENERAL CONDITIONS

SEE FACILITIES LEASE FOR GENERAL CONDITIONS

END OF DOCUMENT

04/02/19

DOCUMENT 00 73 13

SPECIAL CONDITIONS

SEE FACILITIES LEASE FOR SPECIAL CONDITIONS

**HAZARDOUS MATERIALS
PROCEDURES & REQUIREMENTS**

1. SUMMARY

This document includes information applicable to hazardous materials and hazardous waste abatement.

2. NOTICE OF HAZARDOUS WASTE OR MATERIALS

- a. Contractor shall give notice in writing to the District, the Construction Manager, and the Architect promptly, before any of the following materials are disturbed, and in no event later than twenty-four (24) hours after first observance, of any:
 - (1) Material that Contractor believes may be a material that is hazardous waste or hazardous material, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law;
 - (2) Other material that may present a substantial danger to persons or property exposed thereto in connection with Work at the site.
- b. Contractor's written notice shall indicate whether the hazardous waste or material was shown or indicated in the Contract Documents to be within the scope of Work, and whether the materials were brought to the site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible. As used in this section the term "hazardous materials" shall include, without limitation, asbestos, lead, Polychlorinated biphenyl (PCB), petroleum and related hydrocarbons, and radioactive material.
- c. In response to Contractor's written notice, the District shall investigate the identified conditions.
- d. If the District determines that conditions do not involve hazardous materials or that no change in terms of Contract is justified, the District shall so notify Contractor in writing, stating reasons. If the District and Contractor cannot agree on whether conditions justify an adjustment in Contract Price or Contract Time, or on the extent of any adjustment, Contractor shall proceed with the Work as directed by the District.
- e. If after receipt of notice from the District, Contractor does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume Work under special conditions, then District may order such portion of Work that is in connection with such hazardous condition or such affected area to be deleted from the Work, or performed by others, or District may invoke its rights to terminate the Contract in whole or in part. District will determine entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Time as a result of deleting such portion of Work, or performing the Work by others.
- f. If Contractor stops Work in connection with any hazardous condition and in any area affected thereby, Contractor shall immediately redeploy its workers, equipment, and materials, as necessary, to other portions of the Work to minimize delay and disruption.

3. ADDITIONAL WARRANTIES AND REPRESENTATIONS

- a. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have the required levels of familiarity with the Site and the Work, training, and ability to comply fully with all applicable laws and contractual requirements for safe and expeditious performance of the Work, including whatever training is or may be required regarding the activities to be performed (including, but not limited to, all training required to address adequately the actual or potential dangers of Contract performance).
- b. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have and maintain in good standing any and all certifications and licenses required by applicable federal, state, and other governmental and quasi-governmental requirements applicable to the Work.
- c. Contractor represents and warrants that it has studied carefully all requirements of the Specifications regarding procedures for demolition, hazardous waste abatement, or safety practices, specified in the Contract, and prior to submitting its bid, has either (a) verified to its satisfaction that the specified procedures are adequate and sufficient to achieve the results intended by the Contract Documents, or (b) by way of approved "or equal" request or request for clarification and written Addenda, secured changes to the specified procedures sufficient to achieve the results intended by the Contract Documents. Contractor accepts the risk that any specified procedure will result in a completed Project in full compliance with the Contract Documents.

4. MONITORING AND TESTING

- a. District reserves the right, in its sole discretion, to conduct air monitoring, earth monitoring, Work monitoring, and any other tests (in addition to testing required under the agreement or applicable law), to monitor Contract requirements of safe and statutorily compliant work methods and (where applicable) safe re-entry level air standards under state and federal law upon completion of the job, and compliance of the work with periodic and final inspection by public and quasi-public entities having jurisdiction.
- b. Contractor acknowledges that District has the right to perform, or cause to be performed, various activities and tests including, but not limited to, pre-abatement, during abatement, and post-abatement air monitoring, that District shall have no obligation to perform said activities and tests, and that a portion of said activities and tests may take place prior to the completion of the Work by Contractor. In the event District elects to perform these activities and tests, Contractor shall afford District ample access to the Site and all areas of the Work as may be necessary for the performance of these activities and tests. Contractor will include the potential impact of these activities or tests by District in the Contract Price and the Scheduled Completion Date.
- c. Notwithstanding District's rights granted by this paragraph, Contractor may retain its own industrial hygiene consultant at Contractor's own expense and may collect samples and may perform tests including, but not limited to, pre-abatement, during abatement, and post-abatement personal air monitoring, and District reserves the right to request documentation of all such activities and tests performed by Contractor relating to the Work and Contractor shall immediately provide that documentation upon request.

5. COMPLIANCE WITH LAWS

- a. Contractor shall perform safe, expeditious, and orderly work in accordance with the best practices and the highest standards in the hazardous waste abatement, removal, and disposal industry, the applicable law, and the Contract Documents,

including, but not limited to, all responsibilities relating to the preparation and return of waste shipment records, all requirements of the law, delivering of all requisite notices, and obtaining all necessary governmental and quasi-governmental approvals.

- b. Contractor represents that it is familiar with and shall comply with all laws applicable to the Work or completed Work including, but not limited to, all federal, state, and local laws, statutes, standards, rules, regulations, and ordinances applicable to the Work relating to:
 - (1) The protection of the public health, welfare and environment;
 - (2) Storage, handling, or use of asbestos, PCB, lead, petroleum based products, radioactive material, or other hazardous materials;
 - (3) The generation, processing, treatment, storage, transport, disposal, destruction, or other management of asbestos, PCB, lead, petroleum, radioactive material, or hazardous waste materials or other waste materials of any kind; and
 - (4) The protection of environmentally sensitive areas such as wetlands and coastal areas.

6. DISPOSAL

- a. Contractor has the sole responsibility for determining current waste storage, handling, transportation, and disposal regulations for the job Site and for each waste disposal facility. Contractor must comply fully at its sole cost and expense with these regulations and any applicable law. District may, but is not obligated to, require submittals with this information for it to review consistent with the Contract Documents.
- b. Contractor shall develop and implement a system acceptable to District to track hazardous waste from the Site to disposal, including appropriate "Hazardous Waste Manifests" on the EPA form, so that District may track the volume of waste it put in each landfill and receive from each landfill a certificate of receipt.
- c. Contractor shall provide District with the name and address of each waste disposal facility prior to any disposal, and District shall have the express right to reject any proposed disposal facility. Contractor shall not use any disposal facility to which District has objected. Contractor shall document actual disposal or destruction of waste at a designated facility by completing a disposal certificate or certificate of destruction forwarding the original to the District.

7. PERMITS

- a. Before performing any of the Work, and at such other times as may be required by applicable law, Contractor shall deliver all requisite notices and obtain the approval of all governmental and quasi-governmental authorities having jurisdiction over the Work. Contractor shall submit evidence satisfactory to District that it and any disposal facility
 - (1) have obtained all required permits, approvals, and the like in a timely manner both prior to commencement of the Work and thereafter as and when required by applicable law, and
 - (2) are in compliance with all such permits, approvals and the regulations.

For example, before commencing any work in connection with the Work involving asbestos-containing materials, or PCBs, or other hazardous materials subject to regulation, Contractor agrees to provide the required notice of intent to renovate or demolish to the appropriate state or federal agency having jurisdiction, by certified mail, return receipt requested, or by some other method of transmittal for which a return receipt is obtained, and to send a copy of that notice to District. Contractor shall not conduct any Work involving asbestos-containing materials or PCBs unless Contractor has first confirmed that the appropriate agency having jurisdiction is in receipt of the required notification. All permits, licenses, and bonds that are required by governmental or quasi-governmental authorities, and all fees, deposits, tap fees, offsite easements, and asbestos and PCB disposal facilities expenses necessary for the prosecution of the Work, shall be procured and paid for by Contractor. Contractor shall give all notices and comply with the all applicable laws bearing on the conduct of the Work as drawn and specified. If Contractor observes or reasonably should have observed that Plans and Specifications and other Contract Documents are at variance therewith, it shall be responsible for promptly notifying District in writing of such fact. If Contractor performs any Work contrary to applicable laws, it shall bear all costs arising therefrom.

- b. In the case of any permits or notices held in District's name or of necessity to be made in District's name, District shall cooperate with Contractor in securing the permit or giving the notice, but the Contractor shall prepare for District review and execution upon approval, all necessary applications, notices, and other materials.

8. INDEMNIFICATION

To the extent permitted by law, the indemnities and limitations of liability expressed throughout the Contract Documents apply with equal force and effect to any claims or liabilities imposed or existing by virtue of the removal, abatement, and disposal of hazardous waste. This includes, but is not limited to, liabilities connected to the selection and use of a waste disposal facility, a waste transporter, personal injury, property damage, loss of use of property, damage to the environment or natural resources, or "disposal" and "release" of materials associated with the Work (as defined in 42 U.S.C. § 9601 *et seq.*).

9. TERMINATION

District shall have an absolute right to terminate for default immediately without notice and without an opportunity to cure should Contractor knowingly or recklessly commit a material breach of the terms of the Contract Documents, or any applicable law, on any matter involving the exposure of persons or property to hazardous waste. However, if the breach of contract exposing persons or property to hazardous waste is due solely to an ordinary, unintentional, and non-reckless failure to exercise reasonable care, then the procedures for termination for cause shall apply without modification.

END OF DOCUMENT

08/27/18

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access Conditions and Requirements;
- B. Special Conditions.

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Contract consists of the following: Construction of and connections for a new Student Commons Building. Scope includes site paving and landscaping.

1.03 CONTRACTS

- A. Perform the Work under a single, fixed-price Contract.

1.04 WORK BY OTHERS

- A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract:
 - (1) Asbestos removal/abatement.
 - (2) Lead paint removal/abatement.
- B. Work on the Project that will be performed by others concurrent with the Work of this Contract:

[FILL IN OR MODIFY AS APPROPRIATE]

- (1) _____
- (2) _____

1.05 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products **and making building services connections.**
- B. Owner-Furnished Contractor-Installed Products:
 - 1. Short-throw Projectors.
 - 2. Library furniture (tables and chairs, etc.).
 - 3. Student Commons furniture.

- C. Owner-Furnished, Owner-Installed Products:
 - 1. Future, wall-mounted speakers and mounting brackets.
 - 2. Future, 80-inch flat screen monitors and mounting brackets.
 - 3. Designated movable library bookshelf units (on casters).

1.05 CODES, REGULATIONS, AND STANDARDS

- A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.
- B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.06 PROJECT RECORD DOCUMENTS

- A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:
 - (1) Contract Drawings.
 - (2) Specifications.
 - (3) Addenda.
 - (4) Change Orders and other modifications to the Contract.
 - (5) Reviewed shop drawings, product data, and samples.
 - (6) Field test records.
 - (7) Inspection certificates.
 - (8) Manufacturer's certificates.
- B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
- C. Contractor shall record information concurrent with construction progress.
- D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:
 - (1) Manufacturer's name and product model and number.
 - (2) Product substitutions or alternates utilized.
 - (3) Changes made by Addenda and Change Orders and written directives.

1.07 EXAMINATION OF EXISTING CONDITIONS

- A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site or of the streets or roads approaching the Site.
- B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.
- C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the District and the Architect.

1.08 CONTRACTOR'S USE OF PREMISES

- A. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.
- B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.
- C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.
- D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- E. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.
- F. The Contractor shall install the construction fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the District.

1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.
- B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS

- A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.
- B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

1.11 STRUCTURAL INTEGRITY

- A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.
- B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

08/27/18

SECTION 01 21 00

ALLOWANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Non-specified work.

1.2 RELATED SECTIONS

- A. Document 01 10 00 (Summary of Work)
- B. Document 01 29 00 (Payments and Completion)
- C. Document 01 32 19 (Submittal Procedures)

1.3 ALLOWANCES

- A. Included in the Contract, a stipulated sum/price of **[INSERT AMOUNT]** as an allowance for Unforeseen Conditions within the limits set forth in the Bridging Documents. This Allowance shall not be utilized without written approval by the District.
- B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding and equipment rental will be included in Allowance Expenditure Directive authorizing expenditure of funds from this Allowance.
- C. Funds will be drawn from Allowance only with District approval evidenced by an Allowance Expenditure Directive.
- D. At Contract closeout, funds remaining in Allowance will be credited to District by Change Order.

PART 2 - PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

04/02/19

SECTION 01 22 00

ALTERNATES AND UNIT PRICING

PART 1 – ALTERNATES

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Bid Form and Proposal;
- D. Instruction to Bidders.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for alternates and unit pricing.

1.03 DESCRIPTION

- A. The items of work indicated below propose modifications to, substitutions for, additions to and/or deletions from the various parts of the Work specified in other Sections of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the District subject to District's acceptance of Contractor's stated prices contained in this Proposal.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.04 GENERAL

- A. Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an item is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

1.05 BASE BID

- A. The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

1.06 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1.07 ALTERNATE NO. 1 – _____

- A. Provide _____.
 1. As indicated on drawings _____; and as specified in Section _____
- B. Base Bid shall not include _____, but shall include _____.

1.08 ALTERNATE NO. 2 – _____

- A. Provide _____.
 1. As indicated on drawings _____; and as specified in Section _____
- B. Base Bid shall not include _____, but shall include _____.

The above Alternate descriptions are general in nature and for reference purposes only. The Contract Documents, including, without limitation, the Drawings and Specifications, must be referred to for the complete scope of Work.

PART 2 - UNIT PRICING

2.01 GENERAL

- A. Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

2.02 UNIT PRICES

- A. Furnish unit prices for each of the named items on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor, materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).
- B. _____.
- C. _____.

END OF SECTION

02/04/19

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. Instructions to Bidders;
- B. General Conditions, including, without limitation, Substitutions For Specified Items; and
- C. Special Conditions.

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT

- A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.
- B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the District and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.
- C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions. The District's Board has found and determined that certain item(s) shall be used on this Project based on the purpose(s) indicated pursuant to Public Contract Code section 3400(c). These findings, as well as the products and brand or trade names, have been identified in the Notice to Bidders.
- D. The Contractor will not be allowed to substitute specified items unless the request for substitution is submitted as follows:
 - (1) District must receive any notice of request for substitution of a specified item a minimum of ten (10) calendar days prior to bid opening.
 - (2) Within 35 days after the date of the Notice of Award, the Contractor shall submit data substantiating the request(s) for all substitution(s) containing sufficient information to assess acceptability of product or system and impact on Project, including, without limitation, the requirements specified in the Special Conditions and the technical Specifications. Insufficient information shall be grounds for rejection of substitution.
- E. If the District and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall

promptly do so. If any proposed substitution is judged by the District and/or Architect to be unacceptable, the specified material or equipment shall be provided.

- F. Samples may be required. Tests required by the District and/or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the District.
- G. In reviewing the supporting data submitted for substitutions, the District and/or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two (2) submissions of supporting data are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the District will deduct the costs from the Contract Price. The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute.
- H. The Contractor shall, in the event that a substitute is less costly than that specified, credit the District with one hundred percent (100%) of the net difference between the substitute and the originally specified material. In this event, the Contractor agrees to execute a deductive Change Order to reflect that credit. In the event Contractor furnishes a material, process, or article more expensive than that specified, the difference in the cost of that material, process, or article so furnished shall be borne by Contractor.
- I. In no event shall the District be liable for any increase in Contract Price or Contract Time due to any claimed delay in the evaluation of any proposed substitute or in the acceptance or rejection of any proposed substitute.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

08/27/18

SECTION 01 26 00

CHANGES IN THE WORK

CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE PROVISIONS IN THE AGREEMENT, GENERAL CONDITIONS, AND SPECIAL CONDITIONS, IF USED, RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES.

END OF SECTION

08/27/18

SECTION 01 29 00

**APPLICATION FOR PAYMENT AND
CONDITIONAL AND UNCONDITIONAL WAIVER AND RELEASE FORMS**

**CONTRACTOR SHALL COMPLY WITH ALL PROVISIONS IN THE GENERAL CONDITIONS
RELATED TO APPLICATIONS FOR PAYMENT AND/OR PAYMENTS.**

In addition, the contractor and their subcontractors are required to submit a Monthly Report (for Skilled and Trained Workforce, per Section 01 29 00.01) on a monthly basis along with their Application for Payment.

END OF SECTION

03/26/19

**CONDITIONAL WAIVER AND RELEASE
ON PROGRESS PAYMENT
(CIVIL CODE SECTION 8132)**

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _____

Amount of Check: \$ _____

Check Payable to: _____

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:

Date(s) of waiver and release: _____

Amount(s) of unpaid progress payment(s): \$ _____

- (4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

**UNCONDITIONAL WAIVER AND RELEASE
ON PROGRESS PAYMENT
(CIVIL CODE SECTION 8134)**

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment: \$_____

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

**CONDITIONAL WAIVER AND RELEASE
ON FINAL PAYMENT
(CIVIL CODE SECTION 8136)**

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _____

Amount of Check: \$ _____

Check Payable to: _____

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: \$ _____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

**UNCONDITIONAL WAIVER AND RELEASE
ON FINAL PAYMENT
(CIVIL CODE SECTION 8138)**

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: \$ _____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

TERRA LINDA HIGH SCHOOL – STUDENT COMMONS PROJECT

MONTHLY REPORT

Skilled and Trained Workforce
(Public Contract Code section 2600 et seq.)

Month: _____, 2019

In accordance with Public Contract Code section 2600 et seq., all the workers of _____ [INSERT NAME OF CONTRACTOR/SUBCONTRACTOR] performing work in an apprenticeable occupation in the building and construction trades on the project known as Terra Linda High School – Student Commons, 320 Nova Albion Way, San Rafael, California 94903 (the “Project”) are either skilled journeypersons or apprentices registered in an apprenticeship program approved by the Chief of the Division of Apprenticeship Standards of the California Department of Industrial Relations (the “Chief”). “Skilled journeyperson” means a worker who either:

- (1) Graduated from an apprenticeship program for the applicable occupation that was approved by the Chief or located outside California and approved for federal purposes pursuant to the apprenticeship regulations adopted by the Federal Secretary of Labor.
- (2) Has at least as many hours of on-the-job-experience in the applicable occupation as would be required to graduate from an apprenticeship program for the applicable occupation that is approved by the Chief.

In addition, at least _____ percent of the skilled journeypersons employed by _____ [INSERT NAME OF CONTRACTOR/SUBCONTRACTOR] to perform work on the Project are graduates of an apprenticeship program for the applicable occupation.¹ A graduate of an apprenticeship program means either of the following:

- (1) An individual that has been issued a certificate of completion under the authority of the California Apprenticeship Council for completing an apprenticeship program approved by the Chief pursuant to Section 3075 of the Labor Code, or
- (2) An individual that has completed an apprenticeship program located outside California and approved for federal purposes pursuant to the apprenticeship regulations adopted by the federal Secretary of Labor.

Date: _____

Contractor/Subcontractor: _____

Signature: _____

Title: _____

¹Skilled journeypersons employed to perform work on the Project by Contractor or its subcontractors at every tier must be graduates of an apprenticeship program for the applicable occupation at the following percentages per Section 2601: at least 30 percent for work performed on or after January 1, 2017; at least 40 percent for work performed on or after January 1, 2018; at least 50 percent for work performed on or after January 1, 2019; and at least 60 percent for work performed on or after January 1, 2020.

PROJECT MEETINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions; and
- B. Special Conditions.

1.02 PROGRESS MEETINGS

- A. Contractor shall schedule and hold regular weekly progress meetings after a minimum of one week's prior written notice of the meeting date and time to all Invitees as indicated below.
- B. Location: Contractor's field office.
- C. The Contractor shall notify and invite the following entities ("Invitees"):
 - (1) District Representative.
 - (2) Contractor.
 - (3) Contractor's Project Manager.
 - (4) Contractor's Superintendent.
 - (5) Subcontractors, as appropriate to the agenda of the meeting.
 - (6) Suppliers, as appropriate to the agenda of the meeting.
 - (7) Construction Manager, if any.
 - (8) Architect.
 - (9) Engineer(s), if any and as appropriate to the agenda of the meeting.
 - (10) Others, as appropriate to the agenda of the meeting.
- D. The District's, the Architect's, and/or an engineer's Consultants will attend at their discretion, in response to the agenda.
- E. The District representative, the Construction Manager, and/or another District Agent shall take and distribute meeting notes to attendees and other concerned parties. If exceptions are taken to anything in the meeting notes, those exceptions shall be stated in writing to the District within five (5) working days following District's distribution of the meeting notes.

1.03 PRE-INSTALLATION/PERFORMANCE MEETING

- A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work: cutting and patching of plaster and roofing, and other weather-exposed and moisture-resistant products. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.
- B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, Shop Drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated.
- C. Contractor shall review in detail Project conditions, schedule, requirements for performance, application, installation, and quality of completed Work, and protection of adjacent Work and property.
- D. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

08/27/18

SECTION 01 32 13

SCHEDULING OF WORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Summary of Work; and
- D. Submittals.

1.02 SECTION INCLUDES

- A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.
 - (1) Development of schedule, cost and resource loading of the schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method (“CPM”) scheduling (“CPM Schedule”).
 - (2) CPM Schedule shall be cost loaded based on Schedule of Values as approved by District.
 - (3) Submit schedules and reports as specified in the General Conditions.
- B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

1.03 CONSTRUCTION SCHEDULE

- A. Within ten (10) days of being awarded the Contract and before request for first progress payment, the Contractor shall prepare and submit to the Project Manager a construction progress schedule conforming to the Milestone Schedule below.
- B. The Construction Schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.
- C. Milestone Schedule:

ACTIVITY DESCRIPTION

REQUIRED COMPLETION

[FILL IN ACTIVITIES AND DATES]
CONSTRUCTION STARTS
FINAL PROJECT COMPLETION

Date TBD
Date TBD

1.04 QUALIFICATIONS

- A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of [i.e., Primavera Project Planner]. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.
- (1) The written statement shall identify the individual who will perform CPM scheduling.
 - (2) Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.
 - (3) Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths ($\frac{3}{4}$) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.
- B. District reserves the right to approve or reject Contractor's scheduler or consultant at any time. District reserves the right to refuse replacing of Contractor's scheduler or consultant, if District believes replacement will negatively affect the scheduling of Work under this Contract.

1.05 GENERAL

- A. Progress Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.
- B. Overall time of completion and time of completion for each milestone shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by District. Any such agreement shall be formalized by a Change Order.
- (1) District is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.
 - (2) Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.
 - (3) A schedule showing the work completed in less than the Contract Time, and that has been accepted by District, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both District and the Contractor.
- C. Ownership Project Float: Neither the District nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.
- (1) For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.

- (2) Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.
- D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.
- E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. District's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon District, or act to relieve Contractor of its responsibility for means and methods of construction.
- F. Software: Use District Project Planner for Windows, latest version. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District on compact disk at times requested by District.
- G. Transmit each item under the form approved by District.
 - (1) Identify Project with District Contract number and name of Contractor.
 - (2) Provide space for Contractor's approval stamp and District's review stamps.
 - (3) Submittals received from sources other than Contractor will be returned to the Contractor without District's review.

1.06 INITIAL CPM SCHEDULE

- A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.
- B. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.
- C. Initial CPM Schedule shall be time scaled.
- D. Initial CPM Schedule shall be cost and resource loaded. Accepted cost and resource loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed ninety (90) calendar days.
- E. District and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to District.
 - (1) District's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).
 - (2) Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by District. Contractor shall resubmit Initial CPM Schedule if requested by District.

- F. If, during the first ninety (90) days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to District a written Time Impact Evaluation ("TIE") in accordance with Article 1.12 of this Section. The TIE shall be based on the most current update of the Initial CPM Schedule.

1.07 ORIGINAL CPM SCHEDULE

- A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.
- B. Progress Schedule shall include or comply with following requirements:
- (1) Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.
 - (2) No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by District.
 - (a) Activity durations shall be total number of actual work days required to perform that activity.
 - (3) The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.
 - (4) District furnished materials and equipment, if any, identified as separate activities.
 - (5) Activities for maintaining Project Record Documents.
 - (6) Dependencies (or relationships) between activities.
 - (7) Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.
 - (a) Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
 - (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.
 - (8) Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.
 - (a) Include time for fabrication and delivery of manufactured products for the Work.
 - (b) Show dependencies between procurement and construction.
 - (9) Activity description; what Work is to be accomplished and where.
 - (10) The total cost of performing each activity shall be total of labor, material, and equipment, excluding overhead and profit of Contractor. Overhead and profit

of the General Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.

- (11) Resources required (labor and major equipment) to perform each activity.
 - (12) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.
 - (13) Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.
 - (14) Twenty (20) workdays for developing punch list(s), completion of punch-list items, and final cleanup for the Work or any designated portion thereof. No other activities shall be scheduled during this period.
 - (15) Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.
 - (16) Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.
 - (a) Also furnish for each Subcontractor, as determined by District, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.
 - (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.
 - (c) In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by District, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.
 - (d) Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of Original CPM schedule to District. District shall be permitted to attend scheduled meetings as an observer.
 - (17) Activity durations shall be in Work days.
 - (18) Submit with the schedule a list of anticipated non Work days, such as weekends and holidays. The Progress Schedule shall exclude in its Work day calendar all non Work days on which Contractor anticipates critical Work will not be performed.
- C. Original CPM Schedule Review Meeting: Contractor shall, within sixty (60) days from the Notice to Proceed date, meet with District to review the Original CPM Schedule submittal.
- (1) Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by District, in attendance. The meeting will take place over a continuous one (1) day period.

- (2) District's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:
 - (a) Clarifications of Contract Requirements.
 - (b) Directions to include activities and information missing from submittal.
 - (c) Requests to Contractor to clarify its schedule.
- (3) Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by District at the Meeting.

1.08 ADJUSTMENTS TO CPM SCHEDULE

- A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for District's review.
 - (1) District, within ten (10) days from date that Contractor submitted the revised schedule, will either:
 - (a) Accept schedule and cost and resource loaded activities as submitted, or
 - (b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for District to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.
 - (2) District may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.
 - (3) When schedule is accepted, it shall be considered the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.
 - (4) District reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.
- B. Acceptance of Contractor's schedule by District will be based solely upon schedule's compliance with Contract requirements.
 - (1) By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.
 - (2) Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.
 - (3) Submission of Contractor's schedule to District shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply

with requirements of Contract Documents, including adverse effects such as delays resulting from ill timed Work.

- C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.
- D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to District for the record.

1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

- A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.
 - (1) Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.
 - (2) Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.
- B. A meeting will be held on approximately the twenty fifth (25th) of each month to review the schedule update submittal and progress payment application.
 - (1) At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.
 - (2) These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.
 - (3) Contractor shall plan on the meeting taking no less than four (4) hours.
- C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.
- D. Within five (5) work days of receipt of above noted revised submittals, District will either accept or reject monthly schedule update submittal.
 - (1) If accepted, percent (%) complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.
 - (2) If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.
- E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to District by Contractor under this Contract, nor District's review or acceptance of any such report, curve, schedule or narrative shall have the effect of

amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

1.10 SCHEDULE REVISIONS

- A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.
- B. To reflect revisions to the schedule, the Contractor shall provide District with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.
- C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District. District may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide District with a complete written narrative response to District's request.
- D. If the Contractor's revision is still not accepted by District, and the Contractor disagrees with District's position, the Contractor has seven (7) calendar days from receipt of District's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of District's written rejection of a schedule revision shall be contractually interpreted as acceptance of District's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding District's position.
- E. At District's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.11 RECOVERY SCHEDULE

- A. If the Schedule Update shows a completion date twenty-one (21) calendar days beyond the Contract Completion Date, or individual milestone completion dates, the Contractor shall submit to District the proposed revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.
- B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District.
- C. If the Contractor's revisions are not accepted by District, District and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.
- D. At District's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

1.12 TIME IMPACTS EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

- A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within fourteen (14) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show

how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable District to evaluate the impact of changed Work to the scheduled critical path.

- B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.
- C. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with four (4) copies of each TIE.
- D. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Time may be extended in an amount District allows, and the Contractor may submit a claim for additional time claimed by contractor.

1.13 TIME EXTENSIONS

- A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accord with the General Conditions.
- B. Where an event for which District is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate District-caused time impact. The Contractor shall submit its mitigation plan to District within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.
- C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.
- D. No time will be granted under this Contract for cumulative effect of changes.
- E. District will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.
- F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.
- G. If the Contractor does not submit a TIE within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

1.14 SCHEDULE REPORTS

- A. Submit four (4) copies of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.
- B. Required Reports:
 - (1) Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and

actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.

- (2) Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.
- (3) Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.
- (4) Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.
- (5) Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.

C. Other Reports

In addition to above reports, District may request, from month to month, any two of the following reports. Submit four (4) copies of all reports.

- (1) Activities by early start.
- (2) Activities by late start.
- (3) Activities grouped by Subcontractors or selected trades.
- (4) Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.

D. Furnish District with report files on compact disks containing all schedule files for each report generated.

1.15 PROJECT STATUS REPORTING

- A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.
- B. Contractor shall prepare monthly written narrative reports of status of Project for submission to District. Written status reports shall include:
- (1) Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
 - (2) Progress made on critical activities indicated on CPM Schedule.
 - (3) Explanations for any lack of work on critical path activities planned to be performed during last month.
 - (4) Explanations for any schedule changes, including changes to logic or to activity durations.
 - (5) List of critical activities scheduled to be performed next month.

- (6) Status of major material and equipment procurement.
- (7) Any delays encountered during reporting period.
- (8) Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.
 - (a) Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.
 - (b) Contractor shall explain all variances and mitigation measures.
- (9) Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by District at no additional cost.
- (10) Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.16 WEEKLY SCHEDULE REPORT

At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).

1.17 DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to District for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower, and manhours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of District, furnish computer disk of this data base. Obtain District's written approval of daily construction report data base format prior to implementation. Include in report:

- A. Project name and Project number.
- B. Contractor's name and address.
- C. Weather, temperature, and any unusual site conditions.
- D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.
- E. Worker quantities for its own Work force and for Subcontractors of any tier.
- F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

1.18 PERIODIC VERIFIED REPORTS

Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports on the first day of February, May, August, and November during the preceding quarter year; at the completion of the Contract; at the

completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

04/02/19

SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications;
- B. Special Conditions.

1.02 SECTION INCLUDES

- A. Definitions:
 - (1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.
 - (2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.
 - (3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with a specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the District, the Architect, and all other concerned parties and shall furnish, install, or perform the work, at a minimum, in accordance with those instructions.
- B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:
 - (1) Contractor shall submit all Shop Drawings, Product Data, and Samples to the District, the Architect, the Project Inspector, and the Construction Manager.
 - (2) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.
 - (3) Contractor shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery of any item to the Site. Contractor shall be

responsible for any delay in progress of Work due to its failure to observe these requirements.

- (4) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.
- (5) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and "cuts" shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.
- (6) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.
- (7) Contractor shall certify on submittals for review that submittals conform to Contract requirements. Also certify that Contractor-furnished equipment can be installed in allocated space. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Submittals shall not be used as a means of requesting a substitution.
- (8) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.
- (9) Upon demand by Architect or District, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

- (1) Contractor shall prepare its proposed submittal schedule that is coordinated with the proposed construction schedule and submit both to the District within ten (10) days after the date of the Notice to Proceed. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the District.
- (2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revise and resubmit", etc.
- (3) All Submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the District so as not to delay the Construction Schedule.
- (4) Contractor may be assessed \$100 a day for each day it is late in submitting a shop drawing or sample. No extensions of time will be granted to Trade Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule.

1.03 SHOP DRAWINGS

- A. Contractor shall submit one reproducible transparency and six (6) opaque reproductions. The District will review and return the reproducible copy and one (1) opaque reproduction to Contractor.
- B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.
- C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions.
- D. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.
- E. District shall not review Shop Drawings for quantities of materials or number of items supplied.
- F. District's and/or Architect's review of Shop Drawing will be general. District and/or Architect review does not relieve Contractor of responsibility for dimensions, accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. The District's and/or Architect's review of Shop Drawings is not to be construed as approving departures from Contract Documents.
- G. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.
- H. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm that all Work contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.
- I. Submitted drawings and details must bear stamp of approval of Contractor:
 - (1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.
 - (2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked, the District and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.
- J. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.
- K. Contractor shall pay for cost of any changes in construction due to improper checking and coordination. Contractor shall be responsible for all additional costs, including

coordination. Contractor shall be responsible for costs incurred by itself, the District, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.

- L. Shop Drawings must clearly delineate the following information:
- (1) Project name and address.
 - (2) Specification number and description.
 - (3) Architect's name and project number.
 - (4) Shop Drawing title, number, date, and scale.
 - (5) Names of Contractor, Subcontractor(s) and fabricator.
 - (6) Working and erection dimensions.
 - (7) Arrangements and sectional views.
 - (8) Necessary details, including complete information for making connections with other Work.
 - (9) Kinds of materials and finishes.
 - (10) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.
- M. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.
- (1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.
 - (2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. The Contractor shall check and approve all submittal(s) before submitting them for final review.

1.04 PRODUCT DATA OR NON REPRODUCIBLE SUBMITTALS

- A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contractor must submit a minimum of six (6) each, to the District. District shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.
- B. Contractor shall submit six (6) copies of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable.

- C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.
- D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.
- E. Imported Materials Certification must be submitted at least ten (10) days before material is delivered.

1.05 SAMPLES

- A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.
- B. Contractor shall submit four (4) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.
 - (1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.
 - (2) Samples must show full range of texture, color, and pattern.
- C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the District in writing to this effect.
- D. Samples to be shipped prepaid or hand-delivered to the District.
- E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.
- F. Contractor shall not deliver any material to Site prior to receipt of District's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.
- G. District's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.
- H. After a material has been approved, no change in brand or make will be permitted.
- I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ninety (90) days before such materials are required to be used in Work.
- J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.
- K. Field Samples and Mock-Ups are to be removed by Contractor at District's direction:

- (1) Size: As Specified.
- (2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS

- A. The District will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below within twenty-one (21) days after receipt or within twenty-one (21) days after receipt of all related information necessary for such review, whichever is later.
- B. One (1) copy of product or materials data will be returned to Contractor with the review status.
- C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.
- D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within fourteen (14) days after receipt thereof or within fourteen (14) days after receipt of all related information necessary for such review. Such resubmittal shall not delay the Work.
- E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the District and/or the Architect's notes and comments.
- F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.
- G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the District no later than fourteen (14) days or a shorter period as required to comply with the approved Construction Schedule, after its return to Contractor.
- H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.
- I. District's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

04/02/19

SITE STANDARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including without limitation, Site Access, Conditions, and Regulations;
- B. Special Conditions;
- C. Drug-Free Workplace Certification;
- D. Tobacco-Free Environment Certification;
- E. Criminal Background Investigation/Fingerprinting Certification;
- F. Temporary Facilities and Controls.

1.02 REQUIREMENTS OF THE DISTRICT

- A. Drug-Free Schools and Safety Requirements:
 - (1) All school sites and other District Facilities have been declared "Drug-Free Zones." No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds on District property. No students, staff, visitors, or contractors are to use drugs on these sites.
 - (2) Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school owned vehicles and vehicles owned by others while on District property. Contractor shall post: "Non-Smoking Area" in a highly visible location in each work area, staging area, and parking area. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area is to be kept clean at all times.
 - (3) Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.
- B. Language: Profanity or other unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students, staff, volunteers, parents or public will not be allowed.
- C. Disturbing the Peace (Noise and Lighting):
 - (1) Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.

- (2) The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of radios at the Site, except for mobile phones or other handheld communication radios.
- (3) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

D. Traffic:

- (1) Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.
- (2) All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.
- (3) District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.
- (4) Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in softscape areas that could otherwise be damaged.

- E. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

08/27/18

ALTERATION PROJECT PROCEDURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Integration of Work, Purchase of Materials and Equipment, Uncovering of Work and Non-conforming Work and Correction of Work and Trenches;
- B. Special Conditions.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK

- A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.
- B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.
- B. By beginning restoration Work, Contractor acknowledges and accepts the existing conditions.

3.02 PREPARATION

- A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.
- B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.
- C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.
- D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.
- E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate

ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

3.03 INSTALLATION

- A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate District occupancy.
- B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.
- C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.
- D. Contractor shall refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat and square or straight transition to adjacent finishes.
- E. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

3.04 TRANSITIONS

- A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must match existing adjacent work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new Work is not possible, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the District and the Architect for review and approval.

3.05 ADJUSTMENTS

- A. Where removal of partitions or walls results in adjacent spaces becoming one, Contractor shall rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the District and the Architect for review and approval.
- C. Contractor shall trim and seal existing wood doors and shall trim and paint metal doors as necessary to clear new floor finish and refinish trim as required.
- D. Contractor shall fit Work at penetrations of surfaces.

3.06 REPAIR OF DAMAGED SURFACES

- A. Contractor shall patch or replace portions of existing surfaces, which are damaged, lifted, discolored, or showing other imperfections, in the area where the Work is performed.
- B. Contractor shall repair substrate prior to patching finish.

3.07 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS

- A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.
- B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.
- C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified in the Contract Documents, including without limitation, the Drawings.

3.08 FINISHES

- A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.
- B. Contractor shall finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, Contractor shall refinish entire surface to nearest intersections.

3.09 CLEANING

- A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF SECTION

08/27/18

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Obtaining of Permits, Licenses and Registrations and Work to Comply with All Applicable Laws and Regulations;
- B. Special Conditions; and
- C. Quality Control.

1.02 DESCRIPTION

- A. This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction over the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the District and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").
 - (1) 2016 California Building Standards Administrative Code, Part 1, Title 24, CCR.
 - (2) 2016 California Building Code (CBC), Part 2, Title 24, CCR; (2015 International Building Code, Vol. 1 & 2, and 2016 California Amendments).
 - (3) 2016 California Electrical Code (CEC), Part 3, Title 24, CCR; (2014 National Electrical Code and 2016 California Amendments).
 - (4) 2016 California Mechanical Code (CMC), Part 4, Title 24, CCR; (2015 IAPMO Uniform Mechanical Code and 2016 California Amendments).
 - (5) 2016 California Plumbing Code (CPC), Part 5, Title 24, CCR; (2015 IAPMO Uniform Plumbing Code and 2016 California Amendments).
 - (6) 2016 California Energy Code (CEC), Part 6, Title 24, CCR.
 - (7) 2016 California Fire Code (CFC), Part 9, Title 24, CCR; (2015 International Fire Code and 2016 California Amendments).
 - (8) 2016 California Green Building Standards Code (CALGreen), Part 11, Title 24 CCR.

- (9) 2016 California Referenced Standards Code, Part 12, Title 24, CCR.
- (10) State Fire Marshal Regulations, Public Safety, Title 19, CCR.
- (11) Partial List of Applicable National Fire Protection Association (NFPA) Standards:
 - (a) NFPA 13 - Automatic Sprinkler Systems (CA amended), 2016 edition.
 - (b) NFPA 14 - Standpipe and Hose Systems, 2013 edition.
 - (c) NFPA 17A - Wet Chemical Extinguishing Systems, 2013 edition.
 - (d) NFPA 24 - Private Fire Service Mains, 2016 edition.
 - (e) NFPA 72 - National Fire Alarm and Signaling Code, (CA amended); 2016 edition.
 - (f) NFPA 253 - Critical Radiant Flux of Floor Covering System, 2015 edition.
 - (g) NFPA 2001 - Clean Agent Fire Extinguishing Systems, 2015 edition.
- (12) California Division of the State Architect interpretation of Regulations ("DSA IR"), including, without limitation:
 - (a) DSA IR A-6 — Construction Change Document Submittal and Approval Processes.
 - (b) DSA IR A-7 — Project Inspector Certification and Approval.
 - (c) DSA IR A-8 — Project Inspector and Assistant Inspector Duties and Performance.
 - (d) DSA IR A-12 — Assistant Inspector Approval.
- (13) DSA Procedures ("DSA PR")
 - (a) DSA PR 13-01 – Construction Oversight Process
 - (b) DSA PR 13-02 – Project Certification Process

B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, CCR, and the most current version on the date the bids are opened and as it pertains to school construction including, without limitation:

- (1) Test and testing laboratory per Section 4-335. District shall pay for the testing laboratory.
- (2) Special inspections per Section 4-333(c).
- (3) Deferred Approvals per section 4-317(g).
- (4) Verified reports per Sections 4-336 & 4-343(c).
- (5) Duties of the Architect & Engineers shall be per Sections 4-333(a) and 4-341.

- (6) Duties of the Contractor shall be per Section 4-343.
- (7) Duties of Project Inspector shall be per Section 4-334.
- (8) Addenda and Construction Change Documents per Section 4-338.

Contractor shall keep and make available all applicable parts of the most current version of Title 24 referred to in the plans and specifications at the Site during construction.

C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be per Title 24 requirements to the DSA.

- (1) Contractor shall submit the following to Architect for review and endorsement:
 - (a) Product information on proposed material/system supplier.
 - (b) Drawings, specifications, and calculations prepared, signed, and stamped by an architect or engineer licensed in the State of California for that portion of the Work.
 - (c) All other requirements as may be required by DSA.
- (2) Cost of preparing and submitting documentation per DSA Deferred Approval requirements including required modifications to Drawings and Specifications, whether or not indicated in the Contract Documents, shall be borne by Contractor.
- (3) Contractor shall not begin fabrication and installation of deferred approval items without first obtaining DSA approval of Drawings and Specifications.
- (4) Schedule of Work Subject to DSA Deferred Approval: Window wall systems exceeding 10 feet in span.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

08/27/18

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

1.02 DOCUMENT INCLUDES

- A. Abbreviations used throughout the Contract Documents.
- B. Reference to a technical society, organization, or body is by abbreviation, as follows:

1.	AA	Aluminum Association
2.	AAMA	Architectural Aluminum Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	ABPA	Acoustical and Board Products Association
5.	ACI	American Concrete Institute
6.	AGA	American Gas Association
7.	AGC	Associated General Contractors
8.	AHC	Architectural Hardware Consultant
9.	AI	Asphalt Institute
10.	AIA	American Institute of Architects
11.	AIEE	American Institute of Electrical Engineers
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AMCA	Air Moving and Conditioning Association
15.	ANSI	American National Standards Institute
16.	APA	APA-The Engineered Wood Association
17.	ARI	Air Conditioning and Refrigeration Institute
18.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
19.	ASME	American Society of Mechanical Engineers
20.	ASSE	American Society of Structural Engineers
21.	ASTM	American Society of Testing and Materials
22.	AWPB	American Wood Preservers Bureau
23.	AWPI	American Wood Preservers Institute
24.	AWS	American Welding Society
25.	AWSC	American Welding Society Code
26.	AWI	Architectural Woodwork Institute
27.	AWWA	American Water Works Association
28.	BIA	Brick Institute of America
29.	CBC	California Building Code
30.	CCR	California Code of Regulations
31.	CLFMI	Chain Link Fence Manufacturers Institute
32.	CMG	California Masonry Guild
33.	CRA	California Redwood Association
34.	CRSI	Concrete Reinforcing Steel Institute
35.	CS	Commercial Standards

36.	CSI	Construction Specifications Institute
37.	CTI	Cooling Tower Institute
38.	FGMA	Flat Glass Manufacturer's Association
39.	FIA	Factory Insurance Association
40.	FM	Factory Mutual
41.	FS	Federal Specification
42.	FTI	Facing Title Institute
43.	GA	Gypsum Association
44.	ICC	International Code Council
45.	IEEE	Institute of Electrical and Electronic Engineers
46.	IES	Illumination Engineering Society
47.	LIA	Lead Industries Association
48.	MIA	Marble Institute of America
49.	MLMA	Metal Lath Manufacturers Association
50.	MS	Military Specifications
51.	NAAMM	National Association of Architectural Metal Manufacturers
52.	NBHA	National Builders Hardware Association
53.	NBFU	National Board of Fire Underwriters
54.	NBS	National Bureau of Standards
55.	NCMA	National Concrete Masonry Association
56.	NEC	National Electrical Code
57.	NEMA	National Electrical Manufacturers Association
58.	NFPA	National Fire Protection Association/National Forest Products Association
59.	NMWIA	National Mineral Wool Insulation Association
60.	NTMA	National Terrazzo and Mosaic Association
61.	NWMA	National Woodwork Manufacturer's Association
62.	ORS	Office of Regulatory Services (California)
63.	OSHA	Occupational Safety and Health Act
64.	PCI	Precast Concrete Institute
65.	PCA	Portland Cement Association
66.	PDCA	Painting and Decorating Contractors of America
67.	PDI	Plumbing Drainage Institute
68.	PEI	Porcelain Enamel Institute
69.	PG&E	Pacific Gas & Electric Company
70.	PS	Product Standards
71.	SDI	Steel Door Institute; Steel Deck Institute
72.	SJI	Steel Joist Institute
73.	SSPC	The Society for Protective Coatings
74.	TCNA	Tile Council of North America
75.	TPI	Truss Plate Institute
76.	UBC	Uniform Building Code
77.	UL	Underwriters Laboratories Code
78.	UMC	Uniform Mechanical Code
79.	USDA	United States Department of Agriculture
80.	VI	Vermiculite Institute
81.	WCLA	West Coast Lumberman's Association
82.	WCLB	West Coast Lumber Bureau
83.	WEUSER	Western Electric Utilities Service Engineering Requirements
84.	WI	Woodwork Institute
85.	WPOA	Western Plumbing Officials Association

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

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SECTION 01 42 16

DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.
- B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.
- C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.
- D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.
- E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the District and/or the Architect before proceeding.
- F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.
- G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

END OF SECTION

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REFERENCES

PART 1 - GENERAL

1.01 SCHEDULE OF REFERENCES

The following information is intended only for the general assistance of the Contractor, and the District does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

AA	Aluminum Association 1525 Wilson Blvd., Suite 600 Arlington, VA 22209 www.aluminum.org	703/358-2960
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 www.aabchq.com	202/737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 550 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 N Capitol St. NW - Suite 249 Washington, DC 20001 www.transportation.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709 2215 www.aatcc.org	919/549-8141
ACA	American Coatings Association 1500 Rhode Island Ave., NW Washington DC, 20005 www.paint.org	202/462-6272
ACI	American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 www.aci-int.org	248/848-3700
ACPA	American Concrete Pipe Association 8445 Freeport Parkway, Suite 350 Irving, TX 75063-2595 www.concrete-pipe.org	972/506-7216

ADC	Air Diffusion Council 1901 N. Roselle Road, Suite 800 Schaumburg, Illinois 60195 www.flexibleduct.org	847/706-6750
AF&PA	American Forest and Paper Association 1111 Nineteenth Street, NW, Suite 800 Washington, DC 20036 www.afandpa.org	202/463-2700
AGA	American Gas Association 400 North Capitol Street, NW Washington, DC 20001 www.aga.org	202/824-7000
AGC	Associate General Contractors of America 2300 Wilson Blvd., Suite 400 Arlington, VA 22201 www.agc.org	703/548-3118
AHA	American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 domensino.com/AHA/default.htm	847/934-8800
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 www.asphaltinstitute.org	859/288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction One East Wacker Drive Suite 700 Chicago, IL 60601-1802 www.aisc.org	312.670.2400
AIA	American Insurance Association (formerly the National Board of Fire Underwriters) 2101 L Street, NW, Suite 400 Washington, DC 20037 www.aiadc.org	202/828-7100
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org	202/452.7100
AITC	American Institute of Timber Construction 7012 S. Revere Parkway Suite 140 Centennial, CO 80112 www.aitc-glulam.org	303/792.9559

ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	214/565-0593
ALSC	American Lumber Standards Committee, Inc. P.O. Box 210 Germantown, MD 20875 www.alsc.org	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org	847/394-0150
ANLA	American Nursery & Landscape Association 1200 G Street NW, Suite 800 Washington, DC 20005 www.anla.org	202/789-2900
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC, 20036 www.ansi.org	202/293.8020
APA	APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org	253/565-6600
APA	Architectural Precast Association 6710 Winkler Road, Suite 8 Fort Myers, Florida 33919 www.archprecast.org	239/454-6989
ARI	Air Conditioning and Refrigeration Institute 4100 N. Fairfax Drive, Suite 200 Arlington, VA 22203 www.lightindustries.com/ARI	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Public Information Department 750 National Press Building 529 14th Street, NW Washington, DC 20045 www.asphaltroofing.org	202/591-2450
ASA	The Acoustical Society of America ASA Office Manager Suite 1NO1 2 Huntington Quadrangle Melville, NY 11747-4502 http://asa.aip.org	516/576-2360

ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org	800/548-2723 703/295-6300
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 www.asla.org	202/898-2444
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 2980 S River Rd. Des Plaines, IL 60018 http://aspe.org	847/296-0002
ASQ	American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 http://asq.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 901 Canterbury, Suite A Westlake, Ohio 44145 www.asse-plumbing.org	440/835-3040
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 www.astm.org	610/832-9500
AWCI	Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 www.awci.org	703/538-1600
AWPA	American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784 www.awpa.com	205/733-4077

AWPI	American Wood Preservers Institute 2750 Prosperity Ave. Suite 550 Fairfax, VA 22031-4312 www.arcat.com	800/356-AWPI 703/204-0500
AWS	American Welding Society 8669 Doral Boulevard, Suite 130 Doral, Florida 33166 www.aws.org	800/443-9353 305/443-9353
AWI	Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 www.awinet.org	571/323-3636
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794 7711
BHMA	Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th floor New York, NY 10017 www.buildershardware.com	212/297-2122
BIA	The Brick Industry Association 1850 Centennial Park Drive, Suite 301 Reston, VA 20191 www.gobrick.com	703/620-0010
CGA	Compressed Gas Association 14501 George Carter Way, Suite 103 Chantilly VA 20151-2923 www.cganet.com	703/788-2700
CISCA	Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 1064 Delaware Avenue SE Atlanta, GA 30316 www.cispi.org	404/622-0073
CLFMI	Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 www.associationsites.com/main-pub.cfm?usr=clfma	410/290-6267
CPA	Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 www.compositepanel.org	703/724-1128

CPSC	Consumer Product Safety Commission 4330 East West Highway Bethesda, MD 20814 www.cpsc.gov	301/504-7923 800/638-2772
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949 www.calredwood.org	415/382-0662
CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, Georgia 30722-2048 www.carpet-rug.org	706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173 4758 www.crsi.org	847/517-1200
CSI	The Construction Specifications Institute 110 South Union Street, Suite 100 Alexandria VA 22314 www.csinet.org	800/689-2900
CTIOA	Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 www.ctioa.org	310/574-7800
DHI	Door and Hardware Institute (formerly National Builders Hardware Association) 14150 Newbrook Dr. Chantilly, VA 20151 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 2000 2nd Avenue, South Suite 429 Birmingham, AL 35233 www.dipra.org	205/402-8700
DOC	U.S. Department of Commerce 1401 Constitution Ave., NW Washington, D.C. 20230 www.commerce.gov	202/482-2000
DOT	U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 www.dot.gov	855/368-4200
EJMA	Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 www.ejma.org	914/332-0040

EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov	202/272-0167
FCICA	Floor Covering Installation Contractors Association 7439 Millwood Drive West Bloomfield, MI 48322 www.fcica.com	248/661-5015 877/TO-FCICA
FM Global	Factory Mutual Insurance Company Mary Breighner Global Practice Leader Education, Public Entities, Health Care FM Global 9 Woodcrest Court Cincinnati, OH 45246 www.fmglobal.com	513/742-9516
FS	General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov	202/619-8925
GA	The Gypsum Association 6525 Belcrest Road, Suite 480 Hyattsville, MD 20782 www.gypsum.org	301/277-8686
GANA	Glass Association of North America 800 SW Jackson St., Suite 1500 Topeka, KS 66612-1200 www.glasswebsite.com	785/271-0208
HMA	Hardwood Manufacturers Association 665 Rodi Road, Suite 305 Pittsburgh, PA 15235 http://hmamembers.org	412/244-0440
HPVA	Hardwood Plywood & Veneer Association 1825 Michael Faraday Drive Reston, Virginia 20190 www.hpva.org	703/435-2900

IAPMO	International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 www.iapmo.org	909/472-4100
ICC	International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 www.iccsafe.org	888/422-7233
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org	212/419-7900
IES	Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 www.ies.org	212/248-5000
ITRK	Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 www.intertek.com	607/753-6711
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 www.mcaa.org	301/869-5800
MIA	Marble Institute of America 28901 Clemens Rd, Ste 100 Cleveland, OH 44145 www.marble-institute.com	440/250-9222
MMPA (formerly WMMPA)	Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 www.wmmpa.com	530/661-9591 800/550-7889
MSS	Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602 http://mss-hq.org	703/281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org	630/942-6591

NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	703/684-0084
NAPA	National Asphalt Pavement Association 5100 Forbes Blvd. Lanham, MD USA 20706-4407 www.asphaltpavement.org	888/468-6499 301/731-4748
NCSPA	National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 LB9 Dallas, TX 75244 www.ncspa.org	972/850-1907
NCMA	National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 www.ncma.org	703/713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814 www.necanet.org	301/657-3110
NEMA	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1752 Rosslyn, Virginia 22209 www.nema.org	703/841-3200
NEII	National Elevator Industry, Inc. 1677 County Route 64 P.O. Box 838 Salem, New York 12865-0838 www.neii.org	518/854-3100
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts USA 02169-7471 www.nfpa.org	617/770-3000
NHLA	National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com	901/377-1818

NIA	National Insulation Association 12100 Sunset Hills Road, Suite 330 Reston, VA 20190 www.insulation.org	703/464-6422
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net	847/299-9070
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48113-0140, USA www.nsf.org	800/673-6275 734/769-8010
NTMA	National Terrazzo and Mosaic Association PO Box 2605 Fredericksburg, TX 78624 www.ntma.com	800/323-9736
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, D.C. 20210 www.osha.gov	800/321- OSHA (6742)
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 500 New Jersey Ave., N.W. 7 th Floor Washington, D.C. 20001 www.cement.org	847/966-6200 202/408-9494
PCI	Precast/Prestressed Concrete Institute 200 W. Adams St. #2100 Chicago, IL 60606 www.pci.org	312/786-0300
PDCA	Painting and Decorating Contractors of America 2316 Millpark Drive, Ste 220 Maryland Heights, MO 63043 www.pdca.com	800/332- PDCA (7322) 314/514-7322
PDI	Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org	978/557-0720 800/589-8956
PEI	Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com	770/676-9366

PG&E	Pacific Gas & Electric Company www.pge.com	800/743-5000
PLANET	Professional Landcare Network 950 Herndon Parkway, Suite 450 Herndon, Virginia 20170 www.landcarenetwork.org	703/736-9666 800/395-2522 703/736-9668
RFCI	Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange GA 30240 www.rfci.com	706/882-3833
RIS	Redwood Inspection Service 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.redwoodinspection.com	925/935-1499
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	847/458-4647
SDI	Steel Door Institute 30200 Detroit Road Westlake, Ohio 44145 www.steeldoor.org	440/899-0010
SJI	Steel Joist Institute 234 W. Cheves Street Florence, SC 29501 http://steeljoist.org	843/407-4091
SMA	Stucco Manufacturers Association 500 East Yale Loop Irvine, CA 92614 www.stuccomfgassoc.com	949/387.7611
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 www.smacna.org	703/803-2980
SPI	SPI: The Plastics Industry Trade Association, Inc. 1667 K St., NW, Suite 1000 Washington, DC 20006 www.plasticsindustry.org	202/974-5200
SSPC	Society for Protective Coatings (formerly the Steel Structures Painting Council) 40 24th St 6th Fl Pittsburgh, PA 15222 www.sspc.org	412/281-2331 877/281-7772

TCNA	The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 www.tcnatile.com	864/646-8453
TPI	Truss Plate Institute 218 North Lee Street, Suite 312 Alexandria, VA 22314 www.tpinst.org	703/683-1010
TPI	Turfgrass Producers International 2 East Main Street East Dundee, IL 60118 www.turfgrasssod.org	800/405-8873 847/649-5555
TCIA	Tree Care Industry Association (formerly the National Arborist Association) 136 Harvey Road, Suite 101 Londonderry, NH 03053 www.tcia.org	800/733-2622
TVI	The Vermiculite Institute c/o The Schundler Company 150 Whitman Avenue Edison, NJ. 08817 www.vermiculiteinstitute.org	732/287-2244
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com	847/272-8800 877/854-3577
UNI	Uni-Bell PVC Pipe Association 2711 LBJ Freeway, Suite 1000 Dallas, TX 75234 www.uni-bell.org	972/243-3902
USDA	U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 www.usda.gov	202/720-2791
WA	Wallcoverings Association 401 North Michigan Avenue Suite 2200 Chicago, IL 60611 www.wallcoverings.org	312/321-5166

WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 or 6980 S.W. Varns Tigard, OR 97223 www.wclib.org	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, New York 10017 www.wcmanet.org	212/297-2122
WDMA	Window & Door Manufacturers Association 401 N. Michigan Avenue, Suite 2200 Chicago, IL 60611 or 2025 M Street, NW, Ste. 800 Washington, D.C. 20036-3309 www.wdma.com	312/321-6802 202/367-1157
WI	Woodwork Institute P.O. Box 980247 West Sacramento, CA 95798 www.wicnet.org	916/372-9943
WRI	Wire Reinforcement Institute 942 Main Street Hartford, CT 06103 www.wirereinforcementinstitute.org	860/240-9545
WWCA	Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, California 92865 www.wwcca.org	714/221-5520
WWPA	Western Wood Products Association 522 SW Fifth Ave., Suite 500 Portland, OR 97204-2122 www2.wwpa.org	503/224-3930

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

04/02/19

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Inspector, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;
- B. Special Conditions.

1.02 RELATED CODES

- A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.
- B. The Division of the State Architect ("DSA") shall be notified at or before the start of construction.

1.03 OBSERVATION AND SUPERVISION

- A. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, CCR, Part 1, Title 24, Section 4-341.
- B. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District, referred to hereinafter as the "Project Inspector", will observe the work in accordance with CCR, Part 1, Title 24, Sections 4-333(b) and 4-342:
 - (1) The Project Inspector and Special Inspector(s) shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. The Contractor shall provide facilities and operation of equipment as needed, and access as required and shall provide assistance for sampling or measuring materials.
 - (2) The Project Inspector will notify the District and Architect and call the attention of the Contractor to any observed failure of Work or material to conform to Contract Documents.
 - (3) The Project Inspector shall observe and monitor all testing and inspection activities required.

The Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to CCR, Part 1, Title 24, Section 4-343. The Contractor shall supervise and direct the Work and maintain a competent superintendent on the job who is authorized to act in all matters pertaining to the Work. The Contractor's superintendent shall also inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit

verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by Part 1, Title 24, Section 4-336.

1.04 TESTING AGENCIES

- A. Testing agencies and tests shall be in conformance with the General Documents and the requirements of Part 1, Title 24, Section 4- 335.
- B. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer, if any, referred to hereinafter as the "Soils Engineer."
- C. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the "Testing Laboratory." The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

1.05 TESTS AND INSPECTIONS

- A. The Contractor shall be responsible for notifying the District and Project Inspector of all required tests and inspections. Contractor shall notify the District and Project Inspector at least seventy-two hours (72) hours in advance of performing any Work requiring testing or inspection.
- B. The Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.
- C. The District will pay for first inspections and tests required by the "CCR", and other inspections or tests that the District and/or the Architect may direct to have made, including the following principal items:
 - (1) Tests and observations for earthwork and paving.
 - (2) Tests for concrete mix designs, including tests of trial batches.
 - (3) Tests and inspections for structural steel work.
 - (4) Field tests for framing lumber moisture content.
 - (5) Additional tests directed by the District that establish that materials and installation comply with the Contract Documents.
 - (6) Test and observation of welding and expansion anchors.
- D. The District may at its discretion, pay and then back charge the Contractor for:
 - (1) Retests or reinspections, if required, and tests or inspections required due to Contractor error or lack of required identifications of material.
 - (2) Uncovering of work in accordance with Contract Documents.
 - (3) Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.
 - (4) Testing done off Site.
- E. Testing and inspection reports and certifications:

- (1) If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification.
 - (a) The District;
 - (b) The Construction Manager, if any;
 - (c) The Architect;
 - (d) The Consulting Engineer, if any;
 - (e) Other engineers on the Project, as appropriate;
 - (f) The Project Inspector; and
 - (g) The Contractor.
- (2) When the test or inspection is one required by the CCR, a copy of the report shall also be provided to the DSA.

PART 2 - PRODUCTS

2.01 TEST AND INSPECTIONS

- A. Tests and inspections will be required in accordance with the 2016 CBC, unless otherwise specified: Refer to attached DSA-103 – Listing of Structural Tests and Special Inspections – 2016 CBC.

PART 3 - EXECUTION Not Used.

END OF SECTION

02/04/19



DSA-103 Issued 9/1/2017
List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

21-H1

Application No.:

01-117738

Date Submitted: 9/21/2018

Revised:

Revised:

School Name	Terra Linda High School-Student Commons	District	San Rafael City Schools
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IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.

NOTE: This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

INSTRUCTIONS: Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected. **For more information on use of this form, see DSA-103.INSTR.**

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE ¹	PERFORMED BY ²	CODE REFERENCE AND NOTES
-	SOILS			
-	1. GENERAL:	Table 1705A.6		
X	a. Verify that: • site has been prepared properly prior to placement of controlled fill and/or excavations for foundations, • foundation excavations are extended to proper depth and have reached proper material, and • materials below footings are adequate to achieve the design bearing capacity.	Periodic	GE*	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
-	2. COMPACTED FILLS:	Table 1705A.6		
X	a. Perform classification and testing of fill materials.	Test	LOR*	* Under the supervision of the geotechnical engineer.
X	b. Verify use of proper materials, densities and inspect lift thicknesses, placement, and compaction during placement of fill.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
X	c. Test compaction of fill.	Test	LOR*	* Under the supervision of the geotechnical engineer.
-	4. CAST-IN-PLACE DEEP FOUNDATIONS (PIERS):	Table 1705A.8		
X	a. Inspect drilling operations and maintain complete and accurate records for each pier.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
X	c. Verify pier locations, diameters, plumbness, bell diameters (if applicable), lengths, and embedment into bedrock (if applicable). Record concrete or grout volumes.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
X	e. Concrete piers.	Provide tests and inspections per CONCRETE section below.		
-	CONCRETE	Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13		



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List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

21-H1

Application No.:

01-117738

Date Submitted: 9/21/2018

Revised:

Revised:

-	7. CAST IN PLACE CONCRETE			
Material Verification and Testing:				
X	a. Verify use of required design mix.	Periodic	SI*	Table 1705A.3 Item 5, 1910A.1 (1909.2.3*). * To be performed by qualified batch-plant inspector and concrete sampling technician
X	b. Identifiy, sample, and test reinforcing steel.	Test	LOR	1910A.2 (1909.2.4+); ACI 318-14 Section 26.6.1.2. DSA IR 17-10.16
X	c. During concrete placement, fabricate specimens for strength tests,perform slump and air content tests, and determine the temperature of the concrete.	Test	LOR	Table 1705A.3 item 6; ACI 318-14 Sections 26.5 & 26.12
X	d. Test concrete (f'c).	Test	LOR	1905A.1.16 (1909.3.7*); ACI 318-14 Section 26.12.
Inspection:				
X	e. Batch plant inspection <input checked="" type="radio"/> Continuous <input type="radio"/> Periodic	See Notes	SI	Default of 'Continuous' per 1705A.3.3; If approved by DSA, batch plant inspection may be reduced to 'Periodic' subject to requirements in Section 1705A.3.3.1 or eliminated per 1705A.3.3.2. (See Appendix for exemptions.)
-	11. POST-INSTALLED ANCHORS:			
X	a. Inspect installation of post-installed anchors	See Notes	SI*	Table 1705A.3 Item 4a (Continuous) & 4b (Periodic) (see Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13 * May be performed by the project inspector when specifically approved by DSA.
X	b. Test post-installed anchors.	Test	LOR	1910A.5 (1909.2.7*). (See Appendix for exemptions.)
+	MASONRY			



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INCREMENT #

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Revised:

Revised:

-	19. WELDING:				1705A.2.5, Table 1705A.2.1 Items 4 & 5; DSA IR 17-3, AWS D1.1 and AWS D1.8 for structural steel, AWS D1.2 for Aluminum, AWS D1.3 for cold-formed steel, AWS D1.4 for reinforcing steel. (See Appendix for exemptions.)
Verification of Materials, Equipment, Welders, etc:					
X	a. Verify weld filler material identification markings per AWS designation listed on the DSA approved documents and the WPS.	Periodic	SI	DSA IR 17-3.	
X	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	SI	DSA IR 17-3.	
X	c. Verify WPS, welder qualifications and equipment.	Periodic	SI	DSA IR 17-3.	
-	19.1 SHOP WELDING:				
X	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	Continuous	SI	Table 1705A.2.1 Item 5a1-4. Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.	
X	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds	Periodic	SI	1705A.2.2, Table 1705A.2.1 Item 5a.5 & 5a.6. Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.	
X	c. Inspect welding of stairs and railing systems.	Periodic	SI	1705A.2.1. Per AISC 360-10 (and AISC 341-10 as applicable). AWS D1.1 & D1.3. DSA IR 17-3.	
-	19.2 FIELD WELDING:				
X	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	Continuous	SI	Table 1705A.2.1 Item 5a1-4. Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.	
X	b. Inspect single-pass fillet welds ≤ 5/16"	Periodic	SI	Table 1705A.2.1 Item 5a.5. Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.	
X	c. Inspect end-welded studs (ASTM A-108) installation (including bend test)	Periodic	SI	2213A.2 (2212.6.2 ⁺); per AISC 360-10 (and AISC 341-10 as applicable), AWS D1.1. DSA IR 17-3.	
X	d. Inspect floor and roof deck welds	Periodic	SI	1705A.2.2, Table 1705A.2.1 Item 5a.6; per AISC 360 (and AISC 341 as applicable) & AWS D1.3. DSA IR 17-3.	
X	e. Inspect welding of structural cold-formed steel	Periodic	SI*	1705A.2.5; AWS D1.3. * May be performed by the project inspector when specifically approved by DSA. DSA IR 17-3.	
X	f. Inspect welding of stairs and railing systems	Periodic	SI*	1705A.2.1; Per AISC 360-10 (and AISC 341-10 as applicable). AWS D1.1 & D1.3. DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.	
-	20. NONDESTRUCTIVE TESTING:				
X	a. Ultrasonic	Test	LOR	1705A.2.1 & 1705A.2.5. AISC 360-10 N3.3; AISC 341-10 J6.2. AWS D1.1, D1.8. ANSI/ASNT CP-189. SNT-TC-1A. DSA IR 17-2.	
-	23. ANCHOR BOLTS, ANCHOR RODS, & OTHER STEEL:				
X	a. Anchor Bolts and Anchor Rods	Test	LOR	IR 17-11 Sample and test anchor bolts and anchor rods not readily identifiable.	
X	b. Threaded rod not used for foundation anchorage.	Test	LOR	Sample and test threaded rods not readily identifiable per procedures noted in IR 17-11	
+	WOOD				
+	OTHER				



DSA-103

Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

21-H1

Application No.:

01-117738

Date Submitted: 9/21/2018

Revised:

Revised:

List of required verified report(s):

- 1 Soils testing and Inspection: Geotechnical Verified Report - Form DSA-293
- 2 All Structural Testing: Laboratory Verified Report - Form DSA-291
- 3 Concrete Batch Plant Inspection: Laboratory Verified Report - Form DSA-291
- 4 Shop Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292
- 5 Field Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292
- 6 HS Bolt Installation Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292

KEY to Columns

1 Type -	2 Performed By -
Continuous – Indicates that a continuous special inspection is required	GE – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
Periodic – Indicates that a periodic special inspection is required	LOR – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
Test – Indicates that a test is required	SI – Indicates that the special inspection is to be performed by a special inspector

Name of Architect or Engineer in general responsible charge

Timothy L Frei

Name of Structural Engineer (When structural design has been delegated)

Timothy L Frei

Signature of Architect or Structural Engineer

9/20/18

date

IDENTIFICATION STAMP
DIV OF THE STATE ARCHITECT
APP. # 01-117738

AC N/A F/LS N/A SS DATE

**DSA-103**

Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

21-H1

Application No.:

01-117738

Date Submitted: 9/21/2018

Revised:

Revised:

Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.	
Soils:	
X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
Concrete/Masonry:	
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.

Exempted by Design Prof.	
Welding:	
X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).

**DSA-103**

Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

21-H1

Application No.:

01-117738

Date Submitted:

9/21/2018

Revised:

Revised:

X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.
X	4. Epoxy shear dowels in site flatwork.
(Optional) List details for applicable exempt items:	

X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤ 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.
(Optional) List details for applicable exempt items:	

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Site Standards; and
- D. Construction Waste Management and Disposal.

1.02 TEMPORARY UTILITIES

A. Electric Power and Lighting:

- (1) Contractor will pay for power during the course of the Work. To the extent power is available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use.
- (2) Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.
- (3) Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.
- (4) Contractor shall be responsible for maintaining existing lighting levels in the project vicinity should temporary outages or service interruptions occur.

B. Heat and Ventilation:

- (1) Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.
- (2) Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

(1) If Contractor chooses to provide a field office, it shall be an acceptable construction trailer that is well-lit and ventilated. The construction trailer shall be equipped with shelves, desks, filing cabinet, chairs, and such other items of equipment needed. Trailer and equipment are the property of the Contractor and must be removed from the Site upon completion of the Work. Contractor may use the corridor adjacent to the construction area for an office area.

(2) Contractor shall provide any additional electric lighting and power required for the trailer. Contractor shall make adequate provisions for heating and cooling as required.

I. Temporary Facilities:

(1) Power is available from existing buildings.

(2) Water is available from existing buildings or water fountain.

1.03 CONSTRUCTION AIDS

A. Plant and Equipment:

(1) Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workers. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.

(2) Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

B. None of the District's tools and equipment shall be used by Contractor for the performance of the Work.

1.04 BARRIERS AND ENCLOSURES

A. Contractor shall obtain the District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.

C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.

D. Tree and Plant Protection:

(1) Contractor shall preserve and protect existing trees and plants on the Premises that are not designated or required to be removed, and those adjacent to the Premises.

(2) Contractor shall provide barriers to a minimum height of 4'-0" around drip line of each tree and plant, around each group of trees and plants, as applicable,

in the proximity of demolition and construction operations, or as denoted on the Plans.

- (3) Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the District and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged materials as determined by the District.
- (4) Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials which could be harmful to trees and plants, and replace with good soil, at Contractor's expense.
- (5) Excavation around Trees:
 - (a) Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the District.
 - (b) Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the District. Main lateral roots and taproots shall not be cut. All roots 2 inches in diameter and larger shall be tunneled under and heavily wrapped with wet burlap so as to prevent scarring or excessive drying. Smaller roots that interfere with installation of new work may be cut with prior approval by the District. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.
 - (c) Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.
 - (d) Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.
 - (e) Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.
 - (f) Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

1.05 SECURITY

The Contractor shall be responsible for project security for materials, tools, equipment, supplies, and completed and partially completed Work.

1.06 TEMPORARY CONTROLS

A. Noise Control:

- (1) Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.
- (2) Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the District a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration:

- (1) Equipment and impact tools shall have intake and exhaust mufflers.
- (2) Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

C. Dust and Dirt:

- (1) Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.
- (2) Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.
- (3) Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.
- (4) Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water:

- (1) Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

E. Pollution:

- (1) No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.
- (2) Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

F. Lighting:

- (1) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.07 JOB SIGN(S)

A. General:

- (1) Contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the District and/or the Design Professional; locate sign as approved by the District.
- (2) Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

B. Materials:

- (1) Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.
- (2) Sign Surface: Minimum 3/4-inch exterior grade plywood.
- (3) Rough Hardware: Galvanized.
- (4) Paint: Exterior quality, of type and colors selected by the District and/or the Design Professional.

C. Fabrication:

- (1) Contractor shall fabricate to provide smooth, even surface for painting.
- (2) Size: 4'-0" x 8'-0", unless otherwise indicated.
- (3) Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.
- (4) Text and Graphics: As indicated.

1.08 PUBLICITY RELEASES

- A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s) without the written permission of the District.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

04/02/19

SECTION 01 52 13

FIELD OFFICES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Temporary Facilities and Controls.

1.02 SECTION INCLUDES

- A. Requirements for Field Offices and Field Office Trailers.

1.03 SUMMARY

- A. General: Contractor shall provide District's Field Office Trailer and contents, for District's use exclusively, during the term of the Contract.
- B. Property: Trailer, furniture, furnishings, equipment, and the like, supplied by the Contractor with the Office Trailer shall remain the property of the Contractor; District property items installed, delivered, and the like by District within the Office Trailer will remain District's property.
- C. Modifications: District reserves the right to modify the trailer or contents, or both, as may be deemed proper by District.
- D. Condition: Trailer and contents shall be clean, neat, substantially finished, in good, proper, and safe condition for use, operation, and the like; the trailer and contents shall not be required to be new.
- E. Installation Timing: Provide safe, fully furnished, functional, proper, complete, and finished trailer properly ready for entire use, within fourteen (14) calendar days of District's notification of the issuance of Notice to Proceed.

1.04 SUBMITTALS

- A. General: Submit submittals to District in quantity, format, type, and the like, as specified herein.
- B. Office Trailer Data: One (1) copy of manufacturer's descriptive data, technical descriptions, regulatory compliance, industry standards, installation, removal, and maintenance instructions.
- C. Equipment Data: Two (2) copies of manufacturer data for each type of equipment, if directed by District.
- D. Furniture and Furnishings Data: Two (2) copies of manufacturer data for each type of equipment, if directed by District.

- E. Plans: One (1) reproducible copy of appropriately scaled plans of trailer layout. Plans shall include, but not be limited to: lighting; furniture; equipment; telephone and electrical outlets; and the like.
- F. Product Samples: One (1) complete and entire unit of each type, if directed by District.

1.05 QUALITY ASSURANCE

- A. Standards: In the event that provisions of codes, regulations, safety orders, Contract Documents, referenced manufacturer's specifications, manufacturer's instructions, industry standards, and the like, are in conflict, the more restrictive and higher quality shall govern.
- B. Installer: Installer or Installers engaged by Contractor must have a minimum of five (5) years of documented and properly authenticated successful experience of specialization in the installation of the items or systems, or both, specified herein.
- C. Manufacturer: Contractor shall obtain products from nationally and industry recognized Manufacturer with five (5) years minimum, of immediately recent, continuous, documented and properly authenticated successful experience of specialization in the manufacture of the product specified herein.
- D. State Personnel Training: Provide proper training for maintenance and operations, including emergency procedures, and the like, as directed by District.
- E. Units: Shall be sound and free of defects, and shall not include any damage or defect that will impair the safety, installation, performance, or the durability of the entire Office Trailer and appurtenant systems.

1.06 REGULATORY REQUIREMENTS

- A. General: Work shall be executed in accordance with applicable Codes, Regulations, Statutes, Enactments, Rulings, Laws, each authority having jurisdiction, and including, but not limited to, Regulatory Requirements specified herein.
- B. California Building Standards Code ("CBSC").
- C. California Code of Regulations, Title 25, Chapter 3, Sub Chapter 2, Article 3 ("CCR").
- D. Coach Insignia: Trailer shall display California Commercial Coach Insignia; such insignia shall be deemed to show that the trailer is in accordance with the Construction and Fire Safety requirements of CCR.

PART 2 – PRODUCTS

2.01 FIELD OFFICE TRAILER

- A. General: Provide entire Field Office Trailer of type, function, operation, capacity, size, complete with controls, safety devices, accessories, and the like, for proper and durable installation. Partitions, walls, ceiling, and other interior and exterior surfaces shall be appropriately finished, including, but not limited to, trim, painting, wall base, floor covering, suspended or similar ceiling, and the like; provide systems, components, units, nuts, bolts, screws, anchoring devices, fastening devices, washers, accessories, adhesives, sealants, and other items of type, grade, and class required for the particular use, not identified but required for a complete, weather-tight, appropriately operating, and finished installation.

- B. Manufacturers: General Electric Capital Modular Space; The Space Place, Inc.; or equal.
- C. Program: Provide a wheel-mounted trailer with stairs, landings, platforms, ramps, and the like, in good, proper, safe, clean, and properly finished condition; with proper heavy duty locks, and other proper and effective security at all doors, windows, and the like. Trailer shall be maintained in good, proper, safe, clean, and properly finished condition during the Contract.
- (1) Nominal Trailer Size: Four hundred eighty (480) square feet, minimum.
 - (2) Stairs, Platform: Properly finished stairs, platforms, and ramps.
 - (3) Doors: Two (2), three (3) foot wide exterior doors with locksets; finished ramp, steps, and entry platform at each exterior door.
 - (4) Keys: Submit five (5) keys for each door, window, furniture unit, and the like. There shall be no other key copies or originals available; each key shall be identified for District; and shall be labeled, or tagged or both, as directed by District.
 - (5) HVAC: Standard.
 - (6) Lighting: Sixty-five (65) foot-candles illumination minimum at any point, at thirty (30) inches above finished floor throughout from fluorescent light source, exclusively, or as directed by District.
 - (7) Electrical Outlets: One (1) duplex outlet evenly spaced every twelve (12) linear horizontal feet of wall face, and electrical service ready for use.
 - (8) Telephones and Telephone Outlets: Two (2) telephone lines wired, connected to telephone utility service, and ready for use, and two (2) telephone instruments, each with two (2)-line capability, speed dial and hands-free feature. Locate each outlet as directed by District.
 - (9) Voicemail Messaging System or Answering Machine: One (1) unit, two (2)-line; digital.

2.02 FIELD OFFICE TRAILER ITEMS

- A. General: Provide the Field Office Trailer with the following arranged into two (2) workstations:
- (1) Desks: Two (2) desks: thirty-six (36) inches by sixty (60) inches; steel, laminated plastic top; locking, one (1) or two (2) file drawers single pedestal; steel; provide five (5) keys to District.
 - (2) Tables: Two (2) tables; thirty-six (36) inches by sixty (60) inches; twenty-nine (29) inches high; steel, laminated plastic top tables; one (1) at each desk.
 - (3) Chairs: Two (2) chairs: swivel; steel; with seat cushion and arms; one (1) at each desk.
 - (4) Waste Baskets: Two (2) waste baskets, one at each desk.
- B. Furniture and Equipment: Provide in the space located to effect efficient and logical use.

- (1) File cabinet: One (1); four (4) drawer; lateral; steel locking.
- (2) Plan Table: One (1) plan table: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawers.
- (3) Drafting Stool: One (1) drafting stool; swiveling; steel; padded; adjustable; with footrest and casters.
- (4) Bookshelf: One (1) bookshelf: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawer.
- (5) Plan Rack: One (1) wheel mounted plan rack.
- (6) Waste Baskets: One (1) large waste basket.
- (7) Coat/Hat Hanger: Wall mounted with minimum capacity for four (4) garments and ten (10) hats.
- (8) Document Management System: Shall include an integrated high-volume printer, copier, and facsimile machine, including stand, base, and storage cabinet; and shall include the following features:
 - (a) Type: Laser, dry electrostatic transfer, plain paper, digital, multi-function imaging system.
 - (b) Network: Ethernet or Token Ring network ready, Plug-and-Play.
 - (c) Print, send/receive facsimile from any connected workstation.
 - (d) Resolution: Six hundred (600) dots per inch by six hundred (600) dots per inch, minimum.
 - (e) Print Speed: Twenty (20) pages per minute, minimum.
 - (f) Copies: Twenty (20) copies per minute, minimum.
 - (g) Document Handler: Forty (40) sheet, minimum
 - (h) Collator: Forty (40) bin, minimum, with stapling.
 - (i) Duplexing: Capable.
 - (j) Paper Size: Capable of handling paper sizes to eleven (11) inches by seventeen (17) inches.
 - (k) Paper Cassettes: One (1) each for eight and one half (8.5) inches by eleven (11) inches, eight and one half (8.5) inches by fourteen (14) inches, and eleven (11) inches by seventeen (17) inches paper sizes; minimum two hundred fifty (250) sheets per cassette.
 - (l) Reduction/Enlargement: Capable of reduction to twenty-five percent (25%) and enlargement to two hundred percent (200%).
 - (m) Facsimile Electronic Storage: Capable of storing minimum of fifty (50) speed dial numbers, group faxing and broadcast faxing.

- (n) Facsimile Scanning: Capable of scanning into memory a minimum of one hundred (100) pages with maximum scan time of three (3) seconds per page.
 - (o) Halftone: Sixty-four (64) levels.
 - (p) Redial: Automatic and Manual.
- (9) Maintenance: Contractor shall purchase service agreements for each unit of equipment for the duration of the project plus two (2) months, and shall maintain all equipment in proper working condition. Service agreements shall include provision for replacement of toner cartridges and other items required to effect proper unit use. Service agreements shall also provide for:
- (a) Unlimited Service Calls.
 - (b) Same Day Response.
 - (c) All parts, labor, preventative maintenance and mileage.
 - (d) All chemicals, such as toner, fixing agent, and the like.
 - (e) System training and setup.
- (10) Portable Toilets: Two (2); each shall include a urinal; each unit shall be a properly enclosed chemical unit conforming to ANSI Z4.3.
- (a) Location: As directed by District.
 - (b) Maintenance: Maintain each unit and surrounding areas in a clean, hygienic and orderly manner, at all time. Empty, clean, and sanitize each unit each day at a location and time as directed by District.
 - (c) Removal: Relocate, or remove from the site, each Portable Toilet. Upon such directive by District, the Contractor shall forthwith relocate or remove each Portable Toilet and submit the affected areas to a condition which existed prior to the installation of each Portable Toilet, within three (3) calendar days, or as directed by District in writing, at no cost to District.

2.03 UTILITY AND SERVICES

- A. Telephone Service: Contractor shall provide and interface the entire telephone service, and shall properly and timely pay for telephone service for District's non-long-distance use.
- B. Electrical Service: Provide all proper connections and continuously pay for service for the duration of the Work.

2.04 FINISHES

- A. General: Manufacturer standard finish system over surfaces properly cleaned, pretreated, and prepared to obtain proper bond; all visible surfaces shall be coated.
- B. Finish: Color as selected by District from manufacturer standard palette.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Properly prepare area and affected items to receive the Work. Set Work accurately in location, alignment, and elevation; rigidly, securely, and firmly anchor to appropriate structure; install plumb, straight, square, level, true, without racking, rigidly anchored to proper solid blocking, substrate, and the like; provide appropriate type and quantity of reinforcements, fasteners, adhesives, self-adhesive and other tapes; lubricants, coatings, accessories, and the like, as required for a complete, structurally rigid, stable, sound, and appropriately finished installation, in accordance with manufacturer's published instructions, and as indicated. The more restrictive and higher quality requirement shall govern. Moving parts shall be properly secured, without binding, looseness, noise, and the like.
- B. Installation: Install in accordance with 25 CCR 3.2.3 and as directed by District; jack up trailer and level both ways; mount on proper concrete piers with all load off wheels; provide required tie down and accessories per Section 4368 of referenced CCR, and as directed by District.
- C. Rejected Work: Work, materials, unit, items, systems, and the like, not accepted by District shall be deemed rejected, and shall forthwith be removed and replaced with proper and new Work, materials, unit, items, systems, and the like at no cost to District.
- D. Standard: Comply with manufacturer's published instructions, or with instructions as shown or indicated; the more restrictive and higher quality requirement shall govern.
- E. Location: As directed by District.
- F. Fire Resistance: Construct and install in accordance with UL requirements.
- G. Maintenance: Contractor shall maintain trailer and adjacent areas in a safe, clean and hygienic condition throughout the duration of the Work, and as directed by District. Properly repair or replace furniture or other items, as directed by District. Properly remove unsafe, damaged, or broken furniture, or similar items, and replace with safe and proper items. Contractor shall pay cost of all services, repair, and maintenance, or replacement of each item.
- H. Janitorial Service: Provide professional janitorial services, including, but not limited to, trash, waste paper baskets, fill paper dispensers; clean and dust all furniture, files, and the like; sweep and mop resilient and similar flooring; and vacuum carpeting and similar flooring.
 - (1) Frequency: Two (2) times per week, minimum.
- I. Removal: Properly remove the Office Trailer and contents from the Site upon completion of the Contract, or as directed by District in writing. Forthwith properly patch and repair affected areas; replace damaged items with new items. Carefully and properly inventory, clean, pack, store, and protect District property; submit District property to District at a date, time and location as directed by District.

END OF SECTION

02/04/19

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Purchase of Materials and Equipment;
- B. Special Conditions;
- C. Imported Materials Certification.

1.02 MATERIAL AND EQUIPMENT

- A. Only items approved by the District and/or Architect shall be used.
- B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

- A. The District and/or Architect will provide a schedule of colors.
- B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.
- C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.
- B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.
- C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.
- D. Materials are not acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.

- E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, access to the Site or buildings, and underground services. Contractor shall protect material and equipment furnished under Contract.
- F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage at no cost to District.
- G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.
- B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

- A. Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

- A. Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).
- B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

- A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.

- B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

- A. Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

- A. Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

- A. All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF SECTION

08/27/18

SECTION 01 64 00

OWNER-FURNISHED PRODUCTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Materials and Equipment.

1.02 SECTION INCLUDES

- A. Requirements for the following:
 - (1) Installing Owner-furnished materials and equipment.
 - (2) Providing necessary utilities, connections and rough-ins.

1.03 DEFINITIONS

- A. Owner: District, who is providing/furnishing materials and equipment.
- B. Installing Contactor or Installer/Contractor: Contractor, who is installing the materials and equipment furnished by the Owner.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Receive, store and handle products in accordance with the manufacturer's instructions.
- B. Protect equipment items as required to prevent damage during storage and construction.

PART 2 – PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

- A. Installer Contractor's Responsibilities:
 - (1) Verify mounting and utility requirements for Owner-furnished materials and equipment items.
 - (2) Provide mounting and utility rough in for all items where required.
 - (a) Rough in locations, sizes, capacities, and similar type items shall be as indicated and required by product manufacturer.
- B. Owner and Installer Contractor(s) Responsibilities:

- (1) Owner-Furnished/Contractor Installed ("OFCI"): Furnished by the Owner; installed by the Installer Contractor.
- (a) General: Owner and Installer Contractor(s) will coordinate deliveries of materials and equipment to coincide with the construction schedule.
 - (b) Owner will furnish specified materials and equipment delivered to the site. Owner/vendor's representative shall be present on Site at the time of delivery to comply with the contract requirements and Specifications Section 01 60 00, Materials and Equipment, Article 1.04.
 - (c) The Owner furnishing specified materials and equipment is responsible to provide manufacturer guarantees as required by the Contract to the Installer Contractor.
 - (d) The Installer Contractor shall:
 - 1) Review, verify and accept the approved manufacturer's submittal/Shop Drawings for all materials and equipment required to be installed by the Installer Contractor and furnished by the Owner. Any discrepancies, including but not limited to possible space conflicts, should be brought to the attention of the Project Manager and/or Program Manager, if applicable.
 - 2) Coordinate timely delivery. Installer Contractor shall receive materials and equipment at Site when delivered and give written receipt at time of delivery, noting visible defects or omissions; if such declaration is not given, the Installer Contractor shall assume responsibility for such defects and omissions.
 - 3) Store materials and equipment until ready for installation and protect from loss and damage. Installer Contractor is responsible for providing adequate storage space.
 - 4) Coordinate with other bid package contractors and field measurement to ensure complete installation.
 - 5) Uncrate, assemble, and set in place.
 - 6) Provide adequate supports.
 - 7) Install materials and equipment in accordance with manufacturer's recommendations, instructions, and Shop Drawings, supply labor and material required, and make mechanical, plumbing, and electrical connections required to operate equipment.
 - 8) Be certified by equipment manufacturer for installation of the specific equipment supplied by the Owner.
 - 9) Provide anchorage and/or bracing as required for seismic restraint per Title 24, UBC Standard 27-11 and all other applicable codes.

- 10) Provide the contract-required warranty and guarantee for all work, materials and equipment, and installation upon its completion and acceptance by the District. Guarantee includes all costs associated with the removal, shipping to and from the Site, and re-installation of any equipment found to be defective.

C. Compatibility with Space and Service Requirements:

- (1) Equipment items shall be compatible with space limitations indicated and as shown on the Contract Documents and specified in other sections of the Specifications.
- (2) Modifications to equipment items required to conform to space limitations specified for rough in shall not cause additional cost to the District.

D. Manufacturer's printed descriptions, specifications, and instructions shall govern the Work unless specifically indicated or specified otherwise.

2.02 FURNISHED MATERIALS AND EQUIPMENT

- A. All furnished materials and equipment are indicated or scheduled on the Contract Documents.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install equipment items in accordance with the manufacturer's instructions.
- B. Set equipment items securely in place, rigidly or flexibly mounted in accordance with manufacturers' directions.
- C. Make electrical and mechanical connections as indicated and required.
- D. Touch-up and restore damaged or defaced finishes to the District's satisfaction.

3.02 CLEANING AND PROTECTION

- A. Repair or replace items not acceptable to the Architect or District.
- B. Upon completion of installation, clean equipment items in accordance with manufacturer's recommendations, and protect from damage until final acceptance of the Work by the District.

END OF SECTION

08/27/18

SECTION 01 66 00

PRODUCT DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;
- B. Special Conditions.

1.02 PRODUCTS

- A. Products are as defined in the General Conditions.
- B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.
- C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

- A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.
- B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.
- C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

- A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.
- C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.
- D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.
- E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

- F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF SECTION

08/27/18

SECTION 01 71 23

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;
- B. Special Conditions;
- C. Site-Visit Certification.

1.02 REQUIREMENTS INCLUDED

- A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:
 - (1) Survey work required in execution of the Project.
 - (2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS

- A. Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom District makes no objection.

1.04 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.
- B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:
 - (1) Make no changes or relocation without prior written notice to District and Architect.
 - (2) Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - (3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

1.05 RECORDS

- A. Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS

- A. Contractor shall submit name and address of Surveyor and Professional Engineer to District and Architect prior to its/their work on the Project.
- B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.
- C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 COMPLIANCE WITH LAWS

- A. Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

3.02 NONCONFORMING WORK

- A. Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF SECTION

08/27/18

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;
- B. Special Conditions;
- C. Hazardous Materials Procedures and Requirements;
- D. Hazardous Materials Certification;
- E. Lead-Based Paint Certification;
- F. Imported Materials Certification.

1.02 CUTTING AND PATCHING

- A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:
 - (1) Make several parts fit together properly.
 - (2) Uncover portions of Work to provide for installation of ill-timed Work.
 - (3) Remove and replace defective Work.
 - (4) Remove and replace Work not conforming to requirements of Contract Documents.
 - (5) Remove Samples of installed Work as specified for testing.
 - (6) Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - (7) Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.
- B. In addition to Contract requirements, upon written instructions from the District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by District; and remove Work to provide for alteration of existing Work.
- C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

1.03 SUBMITTALS

- A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:
 - (1) The work of the District or other trades.
 - (2) Structural value or integrity of any element of Project.
 - (3) Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.
 - (4) Efficiency, operational life, maintenance or safety of operational elements.
 - (5) Visual qualities of sight-exposed elements.
- B. Contractor's Request shall also include:
 - (1) Identification of Project.
 - (2) Description of affected Work.
 - (3) Necessity for cutting, alteration, or excavations.
 - (4) Effects of Work on District, other trades, or structural or weatherproof integrity of Project.
 - (5) Description of proposed Work:
 - (a) Scope of cutting, patching, alteration, or excavation.
 - (b) Trades that will execute Work.
 - (c) Products proposed to be used.
 - (d) Extent of refinishing to be done.
 - (6) Alternates to cutting and patching.
 - (7) Cost proposal, when applicable.
 - (8) The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.
 - (9) Written permission of District or other District contractor(s) whose work will be affected.

1.04 QUALITY ASSURANCE

- A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.

- B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

1.05 PAYMENT FOR COSTS

- A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the District.
- B. District shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the District.
- B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.
- B. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

3.02 PREPARATION

- A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.
- B. Contractor shall provide devices and methods to protect other portions of Project from damage.
- C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that

may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION

- A. With respect to performance, Contractor shall:
 - (1) Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - (2) Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.
 - (3) Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.
- B. Contractor shall employ original installer or fabricator to perform cutting and patching for:
 - (1) Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.
 - (2) Sight-exposed finished surfaces.
- C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.
- D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.
- E. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.
- F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF SECTION

08/27/18

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Temporary Facilities and Controls.

1.02 SECTION INCLUDES

- A. Administrative and procedural requirements for the following:
 - (1) Salvaging non-hazardous construction waste.
 - (2) Recycling non-hazardous construction waste.
 - (3) Disposing of non-hazardous construction waste.

1.03 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Develop waste management plan that results in end-of Project rates for salvage/recycling of sixty-five percent (65%) by weight (or by volume, but not a combination) of total waste generated by the Work.

1.05 SUBMITTALS

- A. Waste Management Plan: Submit waste management plan within 30 days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:
 - (1) Material category.
 - (2) Generation point of waste.
 - (3) Total quantity of waste in tons or cubic yards.
 - (4) Quantity of waste salvaged, both estimated and actual in tons or cubic yards.
 - (5) Quantity of waste recycled, both estimated and actual in tons or cubic yards.
 - (6) Total quantity of waste recovered (salvaged plus recycled) in tons or cubic yards.
 - (7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for final payment, submit copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Qualification Data: For Waste Management Coordinator.
- I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- J. Submittal procedures and quantities are specified in Section 01 33 00.

1.06 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:
 - (1) Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - (2) Review requirements for documenting quantities of each type of waste and its disposition.
 - (3) Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - (4) Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - (5) Review waste management requirements for each trade.

1.07 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - (1) Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - (2) Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - (3) Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - (4) Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - (5) Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - (6) Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container

labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - (1) Comply with Document 01 50 00 for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - (1) Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - (2) Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - (1) Designate and label specific areas of Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - (2) Comply with Document 01 50 00 for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - (1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.
 - (a) Inspect containers and bins for contamination and remove contaminated materials if found.

- (2) Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
- (3) Stockpile materials away from construction area. Do not store within drip line of remaining trees.
- (4) Store components off the ground and protect from the weather.
- (5) Remove recyclable waste off District property and transport to recycling receiver or processor.

D. Packaging:

- (1) Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- (2) Polystyrene Packaging: Separate and bag material.
- (3) Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on Site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- (4) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

E. Site-Clearing Wastes: Chip brush, branches, and trees on site.

F. Wood Materials:

- (1) Clean Cut-Offs of Lumber: Grind or chip into small pieces.
- (2) Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

- (1) Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.03 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

- (1) Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.
- (2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off District property and legally dispose of them.

SECTION 01 77 00

CONTRACT CLOSEOUT AND FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Completion of Work;
- B. Special Conditions;
- C. Temporary Facilities and Controls.

1.02 CLOSEOUT PROCEDURES

- A. Contractor shall comply with all closeout provisions as indicated in the General Conditions.

1.03 FINAL CLEANING

- A. Contractor shall execute final cleaning prior to final inspection.
- B. Contractor shall clean interior and exterior glass and all surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.
- C. Contractor shall clean equipment and fixtures to a sanitary condition.
- D. Contractor shall replace filters of operating equipment.
- E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.
- F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.
- G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site and surrounding areas.

1.04 ADJUSTING

- A. Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 RECORD DOCUMENTS AND SHOP DRAWINGS

- A. Contractor shall legibly mark each item to record actual construction, including:
 - (1) Measured depths of foundation in relation to finish floor datum.
 - (2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.

- (3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - (4) Field changes of dimension and detail.
 - (5) Details not on original Contract Drawings
 - (6) Changes made by modification(s).
 - (7) References to related Shop Drawings and modifications.
- B. Contractor will provide one set of Record Drawings to District.
 - C. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.06 INSTRUCTION OF DISTRICT PERSONNEL

- A. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six months or by the change of season.
- C. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when the need for such data becomes apparent during instruction.
- E. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.
- B. Contractor shall provide District with all required Operation and Maintenance Data at one time. Partial or piecemeal submissions of Operation and Maintenance Data will not be accepted.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

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SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Completion of the Work;
- B. Special Conditions.

1.02 QUALITY ASSURANCE

- A. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT

- A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").
- B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.
- C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.
- D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.
- E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME

- A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

- C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.
- E. Text: The Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES

- A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.
- E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.
- B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.
- C. Contractor shall include color coded wiring diagrams as installed.
- D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

- G. Contractor shall include manufacturer's printed operation and maintenance instructions.
- H. Contractor shall include sequence of operation by controls manufacturer.
- I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Contractor shall provide control diagrams by controls manufacturer as installed.
- K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).
- O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.07 SUBMITTAL

- A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor's start of Work.
- B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.
- C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.
- D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

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SECTION 01 78 36

WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Warranty/Guarantee Information;
- B. Special Conditions.

1.02 FORMAT

- A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.
- C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier; and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.
- D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 PREPARATION

- A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.
- B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.
- C. Contractor shall co-execute submittals when required.
- D. Contractor shall retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.

- B. Contractor shall submit for District approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the District prior to District's approval of Contractor's final Application for Payment.
- C. For items of work delayed beyond date of completion, Contractor shall provide an updated submittal within ten (10) days after acceptance, listing the date of acceptance as start of warranty period.

PART 2 - PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

08/27/18

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Documents on Work;
- B. Special Conditions.

PART 2 - RECORD DRAWINGS

2.01 GENERAL

- A. As indicated in the Contract Documents, the District will provide Contractor with one set of reproducible, full size original Contract Drawings (mylars).
- B. Contractor shall maintain at each Project Site one set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings ("As-Builts") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blueline prints.
- C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.
- D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.
- E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.02 RECORD DRAWING INFORMATION

- A. Contractor shall record the following information:
 - (1) Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.
 - (2) Actual numbering of each electrical circuit to match panel schedule.
 - (3) Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.
 - (4) Locations of all items, not necessarily concealed, which vary from the Contract Documents.

- (5) Installed location of all cathodic protection anodes.
- (6) Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
- (7) Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
- (8) Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.

In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

- B. Contractor shall provide additional drawings as necessary for clarification.
- C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."
- D. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide electronic copies of the drawings (in PDF format) with one file with all of the sheets and one set of individual sheet files at the conclusion of the Project.

PART 3 - RECORD SPECIFICATIONS

3.01 GENERAL

- A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.
- B. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide one electronic copy of the specifications (in PDF format) at the conclusion of the Project.

PART 4 - MAINTENANCE OF RECORD DOCUMENTS

4.01 GENERAL

- A. Contractor shall store Record Documents apart from documents used for construction as follows:
 - (1) Provide files and racks for storage of Record Documents.
 - (2) Maintain Record Documents in a clean, dry, legible condition and in good order.
- B. Contractor shall not use Record Documents for construction purposes.

PART 5 – PRODUCTS Not Used.

END OF SECTION

08/27/18

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the Owner's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:
 - 1. Verify that the applicable equipment and systems are installed in accordance with the contact documents and according to the manufacturer's recommendations.
 - 2. Verify and document proper integrated performance of equipment and systems.
 - 3. Verify that Operations & Maintenance documentation is complete.
 - 4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
 - 5. Verify that the Owner's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
 - 6. Document the successful achievement of the commissioning objectives listed above.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the technical sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.
- C. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Section 01 11 00 - Summary of Work.
 - 2. Division 22 - Plumbing.
 - 3. Division 23 - Heating Ventilating and Air Conditioning (HVAC).
 - 4. Division 26 - Electrical.

1.3 DEFINITIONS

- A. Basis of Design (BoD) document: A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

- B. Building Envelope: All parts for the exterior shell of a building that provide insulation and air and water resistance such as roofing, windows, flashing, exterior wall cladding, ground contact water proofing, etc.
- C. Commissioning: A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated and maintained to meet the Owner's Project Requirements.
- D. Construction Checklist: A form used by the contractor to verify that appropriate components are on-site, ready for installation, correctly installed and functional.
- E. Control System: A component of environmental, HVAC, security and fire systems for reporting, monitoring and issuing of commands.
- F. Deficiency or Commissioning Issue: A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components.
- G. CxA: Commissioning Authority. The entity identified by the Owner who leads, plans, and schedules and coordinates the commissioning team to implement the commissioning process.
- H. Functional Testing: Generally refers to testing of a complete system and demonstrates control of equipment and the interaction of equipment or systems. Performed by the contractor and witnessed by the CxA.
- I. Installation Verification: Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.
- J. Integrated System Testing: Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.
- K. Issues Log: A formal and ongoing record of problems or concerns and their resolution that have been raised by members of the commissioning team during the course of the commissioning process. Maintained by the CxA.
- L. Owner's Project Requirements (OPR): A collection of documents that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.
- M. Owner: Project Owner or designated representative.
- N. Issues Log: A formal and ongoing record of problems or concerns and their resolution that have been raised by members of the commissioning team during the course of the commissioning process. Maintained by the CxA.

- O. Pre-functional Checklists (PFC): Refers to checklists prepared by the CxA and provided to the contractor to document the complete installation of equipment or systems. Pre-functional checklists are completed by the contractors prior to start-up.
- P. Pre-Functional Test (PFT): An inspection or test that is done before functional testing. PFT's include installation verification and system and component start up tests.
- Q. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.
- R. Seasonal Performance Tests: Functional Tests that are deferred until the system(s) will experience conditions closer to their design conditions.
- S. Site Observation Visit: On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.
- T. Start-up: The initial starting or activating of dynamic equipment or the initial energization and programming of control systems.
- U. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- V. TAB: A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as "Testing, Adjusting, and Balancing" and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.
- W. Training Plan: A written document that details the expectations, schedule and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users and occupants.
- X. Trending: The monitoring by a building management system or other electronic data gathering equipment and analyzing of the data gathered over a period of time to verify proper equipment or systems sequence of operations.
- Y. Warranty Phase Commissioning: Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of system performance, measurement and verification tasks and assistance in identifying warranty issues and enforcing warranty provisions of the construction contract.
- Z. Warranty Visit: A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

1.4 COMMISSIONING TEAM

- A. A project team created to coordinate the commissioning effort that coordinates and communicates with the rest of the project team, attend meetings, and solve problems. This team includes representatives from the contractor, subcontractors and owner.
- B. The prime contractor shall in addition to their representative also appoint a representative from each subcontractor involved in commissioned systems including mechanical, electrical, controls, Test and Balance, plumbing, building envelope, low voltage systems,
- C. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member

of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Construction Project Manager (CM). Thus, the procedures outlined in this specification must be executed within the following limitations:

1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Owner and the Contractor.
2. Commissioning Issues identified by the Commissioning Agent will be delivered to the Construction Manager and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
3. In the event that any Commissioning Issues and suggested resolutions are deemed by the Construction Manager to require either an official interpretation of the construction documents or require a modification of the contract documents, the Construction Manager will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the Construction Manager of any issues that they deem to constitute a potential contract change prior to acting on these issues.
5. Authority for resolution or modification of design and construction issues rests solely with the Construction Manager, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

1.5 OWNER'S RESPONSIBILITIES

- A. Participate in resolution of issues that may occur as a result of the commissioning process.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 1. Coordination meetings.
 2. Training in operation and maintenance of systems, subsystems, and equipment.
 3. Testing meetings.
 4. Demonstration of operation of systems, subsystems, and equipment.

1.6 CONTRACTOR'S AND SUBCONTRACTOR'S RESPONSIBILITIES

- A. Provide utility services required for the commissioning process.
- B. Contractor is responsible for construction means, methods, job safety, or management function related to commissioning on the job site.
- C. Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 1. Participate in construction-phase commissioning meetings including controls coordination meeting to review and resolve any issues with the sequence of operations.
 2. Participate in maintenance orientation and inspection.
 3. Participate in operation and maintenance training sessions.
 4. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 5. Perform quality control of all work and certify it is complete prior to request for inspection.

6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
- D. Contractor shall integrate all commissioning activities into Contractor's master construction schedule.
- E. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
1. Participate in construction-phase coordination meetings.
 2. Participate in maintenance orientation and inspection.
 3. Complete pre-functional checklists for all equipment. Submit completed forms with start-up reports immediately after start up.
 4. Schedule and perform duct air leakage testing as specified in the technical specification sections with CxA as witness.
 5. Provide flushing plans, disinfection reports and water treatment reports to the CxA for review.
 6. Participate in pre-TAB meeting and jobsite inspections to verify TAB readiness.
 7. Provide draft completed TAB report to CxA for review. CxA will identify up to 20% of TAB report for TAB contractor to demonstrate compliance to the completed TAB report.
 8. Participate in procedures meeting for testing.
 9. Perform point-to-point, calibration and checkout of the building automation system and provide completed report to the CxA for review.
 10. Participate in final review at acceptance meeting.
 11. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
 12. Provide information to the CxA for developing construction-phase commissioning plan.
 13. Participate in training sessions for operation and maintenance personnel.
 14. Verify that all systems function correctly by testing each mode of operation, alarm and system function.
 15. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified.
 16. Perform quality control of all work and certify it is complete prior to request for inspection.
 17. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.
 18. Perform seasonal testing, at the direction of the CxA, to prove functional performance of the HVAC and controls in the opposite season.

1.7 ARCHITECT AND DESIGN ENGINEER RESPONSIBILITIES

- A. Responsible for developing the construction contract documents and clarifying the design intent during the construction phase of the project.
- B. Performs construction observation.
- C. Contracted directly to OWNER.

1.8 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.

- B. Prepare a Commissioning Plan. Collaborate with design team, owner, contractor and subcontractors to develop test and inspection procedures. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each
- C. Work with the Contractor to schedule commissioning activities. The Contractor shall integrate all commissioning activities into the master construction schedule. All parties will address scheduling issues in a timely manner in order to expedite the commissioning process.
- D. Review and comment on submittals for compliance with the approved project documents and identify any potential conflicts.
- E. Conduct commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five (5) workdays of the commissioning meeting.
- F. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for permanent power; operation and maintenance data submittals; operation and maintenance training sessions; TAB Work; and Project completion.
- G. Periodically observe and inspect construction and report progress and deficiencies. In addition to compliance with the Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
- H. Prepare Project-specific pre-functional checklists and functional test procedures checklists.
- I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
- J. Review and comment on operation and maintenance documentation for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Division 01 Section "Operation and Maintenance Data."
- K. Review Contractor's operation and maintenance training program. Operation and maintenance training is specified in Division 01 Section "Demonstration and Training."
- L. Prepare commissioning status reports.
- M. Assemble the final commissioning documentation, including the Commissioning Report including applicable Project Record Documents.

1.9 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by CxA, that outlines the process, schedule, allocation of resources, and documentation requirements of the commissioning effort, and shall include, but is not limited to the following:
 - 1. Description of the organization, layout, and content of commissioning documentation to be provided along with identification of responsible parties.
 - 2. Identification of systems and equipment to be commissioned.
 - 3. Description of the level of commissioning for each system
 - 4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
 - 5. Identification of items that must be completed before the next operation can proceed.
 - 6. Description of responsibilities of commissioning team members.
 - 7. Description of observations to be made.

8. Description of requirements for operation and maintenance training, including required training materials.
 9. Provide a schedule for commissioning activities with specific dates coordinated with overall construction schedule.
 10. Define the process for completing pre-functional and startup checklists for systems, subsystems, and list of specific equipment requiring these checklists.
 11. Include Step-by-step procedures for Functional testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.
- B. Pre-Functional Checklists: CxA shall develop pre-functional checklists for all equipment to be commissioned. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent may spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
 - C. Site Visit Reports: CxA shall record test data, observations, and measurements on site visit forms. Updated Issues Log, photographs and other means appropriate for the application shall be included with Report.
 - D. Start-Up Reports: Contractor/Manufacturer created forms that document that factory start-up procedures have been followed for all equipment and systems to be commissioned. Provided by sub-contractors.
 - E. Functional Performance Testing: CxA shall develop functional performance test procedures for all equipment and systems to be commissioned. Site Visit Reports: CxA shall record test data, observations, and measurements on site visit forms. Photographs and other means appropriate for the application shall be included with data.
 - F. Test and Inspection Reports: CxA shall compile test and inspection reports and test and inspection certificates and include them in Systems Manual and commissioning report.
 - G. Commissioning Schedule: CxA shall review and provide input to the master project and construction schedules for commissioning activities.
 - H. Issues Log: CxA shall prepare and maintain an issues log that describes installation, and performance issues that are at variance with the Contract Documents. CxA will identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
 1. Creating an Issues Log Entry:
 - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
 - b. Assign a descriptive title of the issue.
 - c. Identify issue date.
 - d. Identify number of test being performed at the time of the observation, if applicable, for cross-reference.
 - e. Identify system, subsystem, and equipment to which the issue applies.
 - f. Identify location of system, subsystem, and equipment.
 - g. Include information that may be helpful in diagnosing or evaluating the issue.
 - h. Note recommended corrective action.
 - i. Identify commissioning team member responsible for corrective action.
 - j. Identify expected date of correction.
 - k. Identify person documenting the issue.
 2. Documenting Issue Resolution:
 - a. Log date correction is completed or the issue is resolved.
 - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.

- c. Identify changes to the Contract Documents that may require action, if any.
 - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) documenting the issue resolution.
- I. Commissioning Report: CxA shall document results of the commissioning process including performance of systems, subsystems, equipment and issues. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BoD and Contract Documents. The commissioning report shall include, but is not limited to, the following:
 - 1. Discussion of performance of commissioned systems including any variance from OPR, BOD and the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during OWNER occupancy and operation. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.
 - 2. Commissioning Plan.
 - 3. Testing plans and reports.
 - 4. Issues log.
 - 5. Completed test checklists.
 - 6. Listing of off-season test(s) not performed and a schedule for their completion.
- J. Systems Manual: CxA shall gather required information and compile Systems Manual. Systems manual shall include, but is not limited to, the following:
 - 1. As-built system narratives, schematics, and list of installed equipment
 - 2. Operation and maintenance data

1.10 CxA SUBMITTALS

- A. Commissioning Plan: CxA shall submit a draft commissioning plan. Deliver one copy to Contractor and one to OWNER. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final commissioning plan.
- B. Pre-functional Checklists: CxA shall submit sample checklists and forms to Contractor and subcontractors for review, comment and approval. Contractor completed pre-functional checklists are required to be submitted for review and approved prior to proceeding with functional performance testing.
- C. Functional Test Plan: CxA shall submit draft Functional Test Plan and checklists for comment. The final Functional Test Plan will be submitted and used for functional testing.
- D. Site visit reports: CxA shall submit site visit reports as they are created.
- E. Final Commissioning Report: CxA shall submit the draft commissioning report. One copy, with review comments, will be returned to the CxA for preparation of final submittal. The final report submittal must address previous review comments.
- F. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires facilitating the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum the request will include the manufacturer and model number, the manufacturer printed installation and detailed start-up procedures, sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details. In addition, the factory checkout sheets or field technicians shall be submitted for review

1.11 COORDINATION

- A. Scheduling: The Contractor shall work with the Commissioning Agent to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction schedule as directed by the Owner.
- B. Coordinating Meetings: CxA shall conduct coordination meetings of the commissioning team as needed to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- C. Pretesting Meetings: CxA shall conduct pretest meetings with the commissioning team to review startup reports, coordinate controls sequence of operations, review pretest inspection results, review testing and balancing procedures, review testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.
- D. Testing Coordination: CxA shall coordinate with the OWNER and Contractor to plan the sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRE-FUNCTIONAL CHECKLISTS AND FACTORY START UP REPORTS

- A. The following procedures apply to all equipment to be commissioned.
- B. Pre-functional Checklists are developed by the CxA and completed by the appropriate installing contractors for all major equipment and systems being commissioned before functional testing can begin. The checklist captures equipment nameplate and characteristics data, confirming the as-built status of the equipment or system. These checklists also ensure that the systems are complete and operational, so that the functional performance testing can be scheduled. The Contractor and vendors shall execute factory startup and provide the CxA with a copy of the signed and dated completed start-up checklists which will be submitted with the Pre-Functional checklists.
- C. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been followed and completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
 - 1. The full startup plan shall at a minimum consist of the following items:
 - a. The Pre-Functional Checklists.
 - b. The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.

- c. The manufacturer's normally used field checkout sheets.
- D. The Commissioning Agent will review/approve the full start-up plan.
- E. Execution of Pre-functional Checklists and Startup.
 - 1. Pre-Functional checklists will be provided to the project site by the CxA.
 - 2. The contractor shall maintain a master copy of signed checklists.
 - 3. The installing contractors shall update the checklists as work is completed. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off.
 - 4. The CxA will periodically review the checklists for completeness and report on progress at the Cx meetings.
- F. BAS Startup Testing, Adjusting, and Calibration:
 - 1. Work and/or systems installed under this Division shall be fully functioning prior to Demonstration and Acceptance Phase. Contractor shall start, test, adjust, and calibrate all work and/or systems under this Contract, as described below:
 - a. Inspect the installation of all devices. Review the manufacturer's installation instructions and validate that the device is installed in accordance.
 - b. Verify proper electrical voltages and amperages, and verify that all circuits are free from faults.
 - c. Verify integrity/safety of all electrical connections.
 - d. Coordinate with TAB subcontractor to fine tune control settings that are determined from balancing and testing procedures. Record the following control settings as obtained from TAB contractor, and note any TAB deficiencies in the BAS, Pre-functional checklists and initiate an associated Action Item:
 - 1) Optimum duct static pressure setpoints for VAV air handling units.
 - 2) Minimum outside air damper settings for air handling units.
 - 3) Optimum differential pressure setpoints for variable speed pumping systems.
 - 4) Calibration parameters for flow control devices such as VAV boxes and flow measuring stations.
 - 5) BAS contractor shall provide access to the front-end Building Automation System as a minimum to the TAB and CxA to facilitate calibration. Connection for any given device shall local to it (i.e: at the VAV box or at the thermostat). Shall be made at front end and shall allow querying and editing of parameters required for proper calibration and start up.
 - e. Test, calibrate, and set all digital and analog sensing, and actuating devices. Calibrate each instrumentation device by making a comparison between the BAS display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range). Record the measured value and displayed value for each device in the BAS Pre-functional Report.
 - f. Check each digital control point by making a comparison between the control command at the controller and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the OI display. Record the results for each device in the BAS Pre-functional checklists.
 - g. Verify proper sequences by using the approved checklists to record results and submit with BAS Pre-functional checklists. Verify proper sequence and operation of all specified functions. There is inherent duplication between the functional performance testing of the Testing Contractor, and the thorough checking testing of the sequences by the BAS. Generally the sequence

- checkouts indicated as the responsibility of the Testing Contractor under functional testing, must first be tested by the BAS under pre-functional testing.
- h. Verify proper systems operation under emergency power. Cooperate and coordinate with Testing Contractor and CxA for comprehensive building power outage tests.
 - i. Verify all safety devices trip at appropriate conditions. Adjust setpoints accordingly.
 - j. Verify that all alarm thresholds for all analog devices are entered. Request direction from Owner as to alarm threshold parameters.
 - k. Tune all control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the BAS Pre-functional Report. Except from a startup, maximum allowable variance from set point for controlled variables under normal load fluctuations shall be as follows. Within 2 minutes of any upset (for which the system has the capability to respond to) in the control loop, tolerances shall be maintained (exceptions noted):
 - 1) Duct air temperature: $\pm 1^{\circ}\text{F}$.
 - 2) Space Temperature: $\pm 2^{\circ}\text{F}$
 - 3) Hot water temperature: $\pm 2^{\circ}\text{F}$.
 - 4) Duct pressure: $\pm 0.25''$ w.g.
 - 5) Water pressure: ± 1 psid
 - 6) Air flow control: $\pm 5\%$ of setpoint velocity. For min OA flow loops being reset from CO₂, response to upset max time is one hour
 - 7) Space Pressurization (on active control systems): $\pm 0.02''$ wg with no door or window movements

G. For interface and DDC control panels:

- 1. Ensure devices are properly installed with adequate clearance for maintenance and clearly labeled in accordance with the record drawings
- 2. Ensure terminations are safe, secure and labeled in accordance with the record drawings
- 3. Check power supplies for proper voltage ranges and loading.
- 4. Ensure wiring and tubing are run in a neat and workman-like manner, either bound or enclosed in trough.
- 5. Check for adequate signal strength on communication networks.
- 6. Check for stand-alone performance of controllers by disconnecting the controller from the LAN. Verify the event is enunciated at OIs. Verify that the controlling LAN reconfigures as specified in the event of a LAN disconnection.
- 7. Ensure that controller memory and control network through-put are adequate to support the extensive trending requirements. Reconfigure the system to provide a reliable and robust system as necessary.
- 8. Ensure all outputs and devices fail to their proper positions/states.
- 9. Ensure buffered and/ or volatile information is held through power outage.
- 10. With all system and communications operating normally, sample and record update/enunciation times for critical alarms fed from the panel to the OI.
- 11. Check for adequate grounding of all DDC panels and devices.

H. For Operator Interfaces:

- 1. Verify all elements on the graphics are functional and properly bound to physical devices and/or virtual points and that hot links or page jumps are functional and logical.
- 2. Output all specified system reports for review and approval.
- 3. Verify the alarm printing and logging is functional and per requirements
- 4. Verify trend archiving to disk and provide a sample to the CxA for review.
- 5. Verify paging/dial out alarm enunciation is functional.
- 6. Verify functionality of remote OIs and that a robust connection can be established consistently.

7. Verify that required third party software applications required with the bid are installed and functional.
 8. Verify proper interface with fire alarm system.
- I. Submit Start-Up Test Report. Report shall be completed, submitted and approved prior to functional testing.
 - J. Deficiencies, Non-Conformance and Approval in Checklists and Startup.
 1. The Contractor shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
 2. The CxA reviews the report and reports to the OWNER. The CxA shall work with the Contractor and vendors to correct and retest deficiencies or uncompleted items.

3.2 FUNCTIONAL PERFORMANCE TESTING

A. Common Elements For All Systems:

1. Have the required submitted documentation convenient to testing area. Validate that all required documentation has been submitted and is per the contract requirements (very cursory review). CxA shall review the content of the documentation and validate that it is per contract documents.
2. CxA shall review the startup documentation at the start of functional performance testing. Review the startup tests and checklist documentation. CxA shall validate that startup is acceptably executed and complete. CxA shall ensure that any items indicated as outstanding in the checklists is entered as an Action Item and enter one if it is not. The checklists and start up tests/measurements shall be spot checked at the beginning of FPT to ensure accuracy. CxA shall complete a test that indicates he has reviewed the pre-functional checklists and finds them acceptable and note any outstanding items.
3. CxA shall check for and as applicable direct Contractor to demonstrate that access is sufficient to perform required maintenance.
4. CxA shall validate that all prerequisite work is complete and confirm via a test record that he feels it is.
5. Specifically check labeling and ensure conformance to contract requirements.
6. Check proof indication, alarming on failure and restart/acknowledgement as applicable.
7. CxA shall observe operating conditions encountered at the start of FPT. CxA shall examine for normal functionality and record parameters as a test.
8. All dynamic systems powered by electricity shall be tested to simulate a power outage to ensure proper sequencing. Those on emergency power or uninterruptible power shall be tested on all sources.
9. CxA shall inspect the installation and compare it to contract requirements. Record the inspection as a test.
10. Capacities and adjusted and balanced conditions as applicable will generally be checked.
11. Verify all sequence modes and sequences of operation. CxA must initiate all modes and may not refer to or rely on a pre-functional test done by the BAS. Some examples of generic modes that apply to most systems include:
 - a. Off Mode.
 - b. Failed Mode: Proof, safeties, power outage etc. See below for crash testing.
 - c. Start Sequence in various modes.
 - d. Stop sequences in various modes.
12. All adjusted, balanced, controlled systems shall be assessed to determine the optimal setting for the system as applicable. The optimal settings should be determined to

establish reliable, efficient, safe and stable operation. CxA is responsible for placing systems in optimal condition for occupancy and not simply relying on initial design estimated settings.

13. Dynamic Graphics: The graphic for all components, systems, and areas sampled and required to be represented by a graphic shall be checked for adequacy and accuracy. Furthermore, when setpoints are required to be adjustable, verify that they can be adjusted directly from the graphic screen.
 14. All interfaces between two systems or equipment of different manufacturers must be checked for accuracy and functionality.
 15. "Crash Testing": CxA shall analyze systems to identify possible conditions where functionality may be compromised. CxA shall design non-destructive tests that will demonstrate either the automated response to the conditions or so that team can identify the best method for responding or fixing the condition. All tests and finding shall be documented.
- B. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the Contract Documents. Each system will be tested to verify that the system response is as designed. HVAC systems will be checked for conformance to the design sequences of operation and stable control, lighting control will be checked in each type of lighting area, security system cameras will be verified functional and able to see the correct areas. Proper system responses to such conditions as power failure, out of limit condition, equipment failure, etc. shall also be tested.
- C. Early duct air leakage tests shall be performed to ensure green and building code compliance. Point-to-point testing will be performed by controls contractor on all applicable systems, with results given to CxA prior to functional performance testing.
- D. Development of Test Procedures: The test procedures are written by the CxA based upon the final operational sequences from available project documentation. The CxA shall develop specific test procedures and forms to verify and document proper operation of each system. Prior to execution, the CxA shall provide a copy of the test procedures to the Contractor who shall review the tests for feasibility, safety, equipment and warranty protection. The test procedure checklists developed by the CxA shall include the following information:
1. System and equipment or component name(s).
 2. Equipment location and ID number.
 3. Date.
 4. Project name.
 5. Participating parties.
 6. Reference to the specification section describing the test requirements, if applicable.
 7. A copy of the specific sequence of operations.
 8. Prerequisites for the test.
 9. Special cautions, alarm limits, etc.
 10. Specific step-by-step procedures to execute the test.
 11. Acceptance criteria of proper performance with a Yes / No/NA check box.
 12. A section for comments.
- E. Test Methods:
1. Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.
 - a. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.

- b. **Overwritten Values:** Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
 - c. **Simulated Signals:** Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
 - d. **Altering Setpoints:** Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
 - e. **Indirect Indicators:** Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout
 - 2. Functional testing is performed by the contractors with the method and degree of testing as defined in this specification for each system. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition.
 - 3. Multiple identical pieces of equipment may be functionally tested using a sampling strategy. The sampling strategy will be defined in these specifications with the commissioned systems list.
- F. **Coordination and Scheduling:** The Contractor shall provide sufficient notice to the CxA regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the Owners Representative and Contractor upon receipt of the Inspection Request Form. **Problem Solving:** The CxA will recommend solutions to problems found; however, the burden of responsibility to solve, correct and retest problems is with the Contractor and Owner's consultants.

3.3 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Before the operation and maintenance training, CxA shall review training preparation for compliance with project documents.
- B. Training is required per contract specifications. At a minimum, training is required for Mechanical systems, Lighting, and Controls systems.
- C. The CxA requires submission of training records including attendance lists to verify appropriate people received the training.

3.4 COSTS OF COMMISSIONING WORK

- A. The cost to the Contractor and Subcontractors to comply with the specified requirements and to support the work of the CxA shall be included in the Contractor's and Subcontractor's bid price.
- B. It is the Contractor's responsibility to QC and pre-test all building equipment and systems. The CxA shall confirm function of each system. If a device, piece of equipment, sequence, or system fails a test, corrections shall be made immediately and retested. Corrections that cannot be corrected immediately or that delay completion of CxA testing shall be reimbursed by the Contractor.

3.5 COMMISSIONED SYSTEMS

System	Equipment	Note
HVAC System	Make-Up Air Units	5
	Packaged Rooftop Units	5
	Hot Water Systems	5
	Split Systems	5
	Variable Refrigerant Systems	5
	Air Handling Systems	5
	Fan coil units	5
	Exhaust fans	5
	Test and balance report values	3
Building Management System	Sequences of operation, monitored points, and alarms	5
	Metering/monitoring devices and equipment	5
	Software commissioning, GUI presentation commissioning, system access performance criteria, software tools/source code commissioning, instrument data sheets, middleware commissioning, Internet Protocol commissioning.	5
Electrical System	Sweep or scheduled lighting controls	3
	Day-light dimming controls	3
	Lighting occupancy sensors	3
Plumbing System	Domestic water heaters	5
	Thermostatic mixing valves	5
	Compressed Air System	5
	Vacuum Pump	5

Levels Defined:

Level 1 - The CxA will periodically observe and inspect the installation of equipment and systems and review project documentation (test reports) to verify operational requirements meet the contract documents.

Level 2 - The CxA will periodically observe and inspect the installation of equipment and systems and review project documentation (test reports). The CxA may spot check some of the system functions verify operational requirements are met.

Level 3 - The CxA will periodically observe and inspect the installation of equipment and systems and review project documentation (test reports) and will witness contractor performance testing of the system. Contractor shall test up to 20% of the system to prove operational requirements are met. The test sections shall be chosen at random by the CxA. Failure of any test section shall require retesting of that section and an additional test section equivalent in scope.

Level 4 - The CxA will periodically observe and inspect the installation of equipment and systems and review project documentation (test reports) and will witness contractor performance testing of the system. Contractor shall test up to 50% of the system to prove operational requirements are met. The test sections shall be chosen at random by the CxA. Failure of any test section shall require retesting of that section and an additional test section equivalent in scope.

Level 5 - The CxA will periodically observe and inspect the installation of equipment and systems and review project documentation (test reports) and will witness contractor performance testing of the system. Contractor shall test up to 100% of the system to prove operational requirements are met. The test sections shall be chosen at random by the CxA. Failure of any test section shall require retesting of that section and an additional test section equivalent in scope.

3.6 METHODS OF TESTING

A. HVAC Systems:

1. CxA may witness duct air leakage testing during rough-in. Contractor to forward all duct air leakage reports to CxA for review.
2. CxA will visit the site during rough-in of ductwork, piping and equipment to verify proper maintenance clearances and access are being maintained.
3. The CxA may witness contractor and/or factory start-up of equipment.
4. The TAB contractor shall re-measure up to 20% of the TAB report values for the CxA to observe.
5. Stand-alone controls will be tested independent of item B below.
6. Contractor will demonstrate to the CxA that the operation of each system through all modes, alarms, and operating parameters meet the contract documents.

B. Building Management System:

1. After receipt of the controls contractor's calibration and point to point reports by the CxA, the controls contractor will re-measure some of the points for the CxA to verify that the calibration and communication is correct. The points to be verified will be selected by the CxA.
2. Controls contractor shall provide an as-built shop drawing to the CxA for use in executing FPT.
3. All of the user graphics interfaces and displayed operating points will be demonstrated for the CxA by the controls contractor.
4. Controls contractor shall manipulate the system to demonstrate that it performs all of the specified modes of operation.
5. Points selected by the CxA will be trended for 1-2 weeks by the controls contractor to verify control operation and response. System to in auto without alarms.

C. Electrical Systems:

1. During the installation the CxA will perform the following for the electrical systems:
 - a. Periodically observe the installation of equipment.
 - b. Review the completed Pre-functional Checklists (PFC).

- c. Verify the PFC's by observing the completed work and comparing to the values listed in the PFC.
 - d. Review the factory authorized programming and checkout report of the lighting control panels and devices.
 - e. The contractor is to provide NETA certified third party testing of the power distribution system and provide the CxA with a certified test report.
 - f. CxA will review contractor provided as-builts for proper identification and labeling of all equipment, piping and devices.
2. To test the performance of the lighting control system the CxA will perform the following tasks:
- a. Witness the contractor testing each scene from each wall station.
 - b. Verify these scenes match the design intent from the contract documents.
 - c. Witness the contractor testing the integration to the other integrated systems such as audio visual and monitoring abilities from the BMS.
 - d. Verify this integration allows control and/or monitoring from the other systems.
 - e. Verify connectivity to the emergency lighting circuits.
 - f. Witness the contractor testing the emergency lighting circuits.
3. Upon completion of the emergency power system, factory start-up and contractor pretesting, the CxA will witness a contractor test to verify complete system power loss and verify proper power provision of critical systems. The test will not be scheduled until all other systems dependent on emergency power have been tested and approved.

D. Plumbing:

- 1. Domestic hot water will be tested by the CxA by measuring the hot water temperature at a percentage of the fixtures along with the time it takes to reach that temperature.
- 2. Contractor shall demonstrate domestic hot water boilers, pumps and controls through all modes of operation and alarms.
- 3. Contractor shall demonstrate to the CxA that the sanitary sewer and domestic booster pump operation through all modes and alarms meets approved sequence of operations.
- 4. After contractor has adjusted all fixtures for proper flush and sink fixture metering, the CxA will test plumbing fixtures for proper operation.
- 5. The contractor shall demonstrate the water management system to the CxA.
- 6. The CxA will test the dental compressed air and vacuum systems for proper operation.

E. Contractor Certification Letter of Systems Readiness (See attached EXHIBIT A)

Systems Functional Testing Readiness Certification and Notification Letter for Commissioning

San Rafael City Schools / Terra Linda High School
320 Nova Albion Way, San Rafael, CA 94903

This letter shall serve as certification to 3QC that all applicable systems checked below have been fully tested to perform as specified in the Construction Documents, in accordance with 3QC's Functional Testing Checklists, and that all functional testing prerequisites as outlined in the Commissioning Specifications and Commissioning Plan have been completed and submitted to 3QC for review. 3QC is hereby officially notified to begin onsite functional testing of the following systems:

Systems Ready for Functional Testing by 3QC (Completed by General Contractor or CM at Risk <u>as systems become available</u> and are ready for testing – meeting all criteria explained here within)		
Check Applicable System	Systems	Date GC is Requesting for CxA on-site Functional Testing **
<input type="checkbox"/>	TAB Verification	
<input type="checkbox"/>	BMS, BAS, DDC or EMS	
<input type="checkbox"/>	HVAC Systems	
<input type="checkbox"/>	Plumbing Systems	
<input type="checkbox"/>	Lighting Control Systems	
<input type="checkbox"/>	Renewable Energy Systems	
<input type="checkbox"/>	Irrigation	

**** = Systems Technician Required** – The contractor certifies that a systems technician familiar with and capable of operating each system to be commissioned will be available onsite throughout functional testing by 3QC. For BMS, BAS, DDC or EMS systems this must be the commissioning technician/programmer.

Failed Functional Testing – If 3QC arrives onsite, on the date indicated above, for functional testing which cannot be completed due to systems readiness failure, systems technician no-show, or other circumstances not caused by 3QC resulting in failed functional testing; it is understood that 3QC's client (listed below) will be invoiced for expenses incurred by 3QC. The contractor also agrees to reimburse said client for incurred expenses. 3QC expenses will be invoiced as follows:

- Travel expenses as applicable
- \$2,200/day for each on-site 3QC CxA

Signature of 3QC's Client or Representative Print Name Date

Signature of General Contractor or CM at Risk Print Name Date

END OF SECTION

03/19/19

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of selected site elements.
 - 2. Salvage of existing items to be reinstalled.

- B. Related Requirements:

- 1. Section 01 11 00 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
 - 3. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures.
 - 4. Section 31 10 00 "Site Preparation and Plant Protection" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
4. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Coordination of Owner's continuing occupancy of portions of existing buildings.
- B. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove site utility systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 3. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."
- B. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 8. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Protect items from damage during transport and storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Remove:
 - 1. Designated (e) landscaping
 - 2. Designated (e) utility related items
 - 3. Designated (e) asphalt concrete paving.
 - 4. Designated (e) trees. Grub roots and stumps.
 - 5. Designated (e) planters.
 - 6. Designated (e) utility enclosure and associated electrical lines.
 - 7. Designated (e) area drains.
 - 8. Designated (e) storm drain lines.
 - 9. Designated (e) inlets.
 - 10. Designated (e) sanitary sewer lines.
 - 11. Designated portion of (e) retaining wall.
- B. Remove and Reinstall:
 - 1. Designated (e) trash compactor.
- C. Existing to Remain:
 - 1. Designated (e) paving.
 - 2. Designated (e) trees.
 - 3. Designated (e) sanitary sewer lines.

4. Designated (e) catch basins.
5. Designated (e) utility boxes.

END OF SECTION

03/25/19

SECTION 03 11 00
CONCRETE FORMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Form-facing material for cast-in-place concrete.
 - 2. Shoring, bracing, and anchoring.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 32 13 13 "Landscape Site Concrete" for formwork related to concrete pavement and walks.

1.2 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Concrete Institute (ACI)
Corps of Engineers
U. S. Department of Commerce Product Standard (PS)
Western Wood Products Association (WWPA)
West Coast Lumber Inspection Bureau (WCLIB)

1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Exposed surface form-facing material.
 - 2. Form ties.
 - 3. Spreaders.
 - 4. Waterstops.
 - 5. Form-release agent.

- B. Samples: Submit samples of form ties, spreaders, and waterstops.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 REGULATORY REQUIREMENTS

- A. Except as modified by the requirements specified herein or the details on the drawings, formwork shall conform to the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 19A - Concrete.
- B. CalGreen Requirements: Form coatings shall comply with environmental requirements of 2016 California Building Code (CBC) Title 24 Part 11.
 - 1. The quantity of volatile organic compounds (VOC) used in coating products shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Carry out the engineering and construction of all formwork, shoring, and bracing, by and under the direction of the Contractor. The Contractor shall be held responsible for the engineering, construction, maintenance, and safety of all formwork during the entire construction period.
- B. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
- C. Design formwork for the loads and lateral pressures outlined in Part 3, Section 102, of ACI 347R-14, and lateral forces as specified by the CBC Title 24 Part 2.

2.2 FORM-FACING MATERIALS

- A. Forms for Unexposed Concrete: Form concrete surfaces that will not be exposed in the finished structure with plywood, lumber, metal or other acceptable material.
 - 1. Lumber: Standard or better grade Douglas fir, meeting the requirements of WCLIB "Standard No. 17, Grading Rules for West Coast Lumber" or WWPA "Western Lumber Grading Rules 2011". Use boards that are surfaced on at least 2 edges and one side for a tight fit.

2. Plywood: B-B Plyform, Class I, Exterior grade meeting the requirements of PS 1-09, 5/8-inch minimum thickness for 12-inch stud spacing and 3/4-inch minimum thickness for 16-inch stud spacing.
- B. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
1. Where an as-cast surface finish is indicated, provide High Density Overlay Plyform Class I Exterior plywood meeting the requirements of PS 1-09.
 2. Where sacked, rubbed or sandblasted surface finish is indicated, provide B-B Plyform Class I Exterior plywood meeting the requirements of PS 1-09.
- C. Form Liners: Form architectural finish concrete surfaces with PVC or ABS plastic, fiberglass reinforced plastic or elastomeric urethane form liners of face design indicated.

2.2 WATERSTOPS

- A. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Profile: As indicated.
 2. Dimensions: 4 inches by 3/16 inch thick; nontapered.

2.3 RELATED MATERIALS

- A. Framing, Studding and Bracing: "Standard" or "Construction" grade Douglas fir, rough or S4S, meeting the requirements of WCLIB "Standard No. 17, Grading Rules for West Coast Lumber" or WWPA "Western Lumber Grading Rules 2011".
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
 3. Coatings containing mineral oils or other nondrying ingredients will not be permitted.
- C. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1-inch of concrete face. Inner tie rod shall be left in concrete when forms are removed. Wire ties or wood spreaders will not be permitted.
- D. Nails: Common wire, steel.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.

- B. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes. Camber formwork where necessary to compensate for anticipated deflections due to fresh concrete and construction loads.
- D. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 - 2. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- E. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- F. Construct forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and the like, for easy removal.
- G. Do not use rust-stained steel form-facing material.
- H. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips.
 - 2. Use strike-off templates or compacting-type screeds.
- I. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- J. Chamfer exterior corners and edges of permanently exposed concrete 3/4-inch, unless otherwise indicated. Provide molding in forms for all chamfering required.
- K. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- L. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- M. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.

2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 3. Place joints perpendicular to main reinforcement.
 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- N. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- O. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- P. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- Q. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
1. Thoroughly clean forms and coat with specified form coating before each use.
 2. Do not reuse forms for exposed construction which cannot be reconditioned to "like new" condition.
- R. Earth Forms: Earth forms may be used for footings only where the soil is firm and stable and the concrete will not be exposed to view. Where earth forms are to be used, excavations shall be cut neat and accurately to size for placing of concrete directly against the excavation. Except for bottom of footings, allow for one-inch additional concrete beyond the dimensions or profiles shown on the drawings. Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from sloughing. Form sides of footings where earth sloughs more than 6-inches. Earth forms shall be tamped firm and cleaned of all debris and loose material before depositing concrete.
- S. Wood Forms: Construct forms of sound material to the correct shape and dimensions, mortar tight, and of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of exact shape under imposed loads. They shall be so constructed that they may be easily removed without damage to the concrete. Before concrete is placed in forms, carefully verify the horizontal and vertical position of the form and correct inaccuracies. Complete wedging and bracing in advance of placing of concrete.
- T. Framing bracing, supporting members, and centering shall be of ample size and strength to safely carry, without deflection, dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent bulging or sagging of forms. Concrete out of line, level, or plumb will be cause for rejection of the whole construction affected.
- U. Tolerances: Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of ACI 117-10.
- V. Chamfered Corners: Chamfer exposed corners 3/4-inch, unless otherwise indicated. Provide molding in forms for all chamfering required.

- W. Form Ties: Use ties of sufficient strength and in sufficient quantities to prevent spreading of the forms. Place ties at least 1 inch away from the finished surface of the concrete.
- X. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- Y. Joints: Install construction joints, isolation joints, shrinkage control joints and expansion joints as approved. Coordinate location of construction joints, particularly those exposed to view at walls and columns, in advance of concrete placement.
- Z. Inspection: Before placing of concrete, and after placement of reinforcing steel in the forms, provide notification so that proper inspection can be made. Make such notification at least 2 working days in advance of placing concrete.
- AA. Rejection of Defective Work: Any movement or bellying of forms during construction or variations in excess of the tolerances specified will be considered just cause for the removal of such forms and, in addition, the concrete construction so affected. Reconstruct forms, place new concrete and required reinforcing steel at no additional cost to the Owner.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
 - 5. Clean embedded items immediate prior to concrete placement.
- B. Embedded Piping and Rough Hardware:
 - 1. Coordinate with other trades who are required to fasten materials to formwork, or who are required to insert piping, boxes, bolts, anchors, inserts, or other rough hardware, within the forms.
 - 2. Locate conduits or pipes so as not to reduce the strength of the construction, and in no case place in a slab less than 4-inches thick except for local offsets. Do not bury conduit in a concrete slab with an outside diameter greater than 30 percent of the thickness of the slab, and do not place conduit under slab reinforcing steel, except for slab mesh. Place conduits parallel to roof slab span.

3.3 INSTALLATION OF WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.
 - 1. Install in longest lengths practicable.
 - 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 - 3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 03 30 00 "Cast-In-Place Concrete."
 - 4. Secure waterstops in correct position at **12 inches** on center.

5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.
 - a. Miter corners, intersections, and directional changes in waterstops.
 - b. Align center bulbs.
6. Clean waterstops immediately prior to placement of concrete.
7. Support and protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work.
 1. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces.
 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 1. Align and secure joints to avoid offsets.
 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.
- D. When shores and other vertical supports are so arranged that the form facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as specified or permitted.
 1. The shores and supports shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- E. Whenever the formwork is removed during the curing period, cure the exposed concrete by one of the methods specified in Section 03 30 00.
- F. Construction loads exceeding the design loads shall not be imposed on any member unless it is properly shored and braced.
- G. Use softwood wedges to release form faces from concrete. Do not pry with metal tool.

3.5 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. When reshoring is permitted or required the operations shall be planned in advance and shall be subject to review.
- C. Perform reshoring for the purpose of early form removal so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no live loads shall be permitted on the new construction. Tighten reshores to carry their required loads but do not over tighten so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- D. Floors supporting shores under wet concrete shall have at least one-half the load capacity of the shores above and shall be distributed in approximately the same pattern as those above. These reshores shall remain in place until the freshly-placed concrete has reached 75 percent of its specified 28-day strength, unless otherwise specified or permitted.

END OF SECTION

09/21/18

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel reinforcement bars.
 - 2. Welded-wire reinforcement.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 32 13 13 "Landscape Site Concrete" for reinforcing related to concrete pavement and walks.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Concrete Institute (ACI)
American Society for Testing and Materials (ASTM International)
Concrete Reinforcing Steel Institute (CRSI)
American Welding Society (AWS)
American Concrete Institute (ACI)

1.3 ACTION SUBMITTALS

- A. Product Data: Submit mill affidavits, stating the grades and physical and chemical properties of the reinforcing steel, and conformance with ASTM Specifications, before delivery of the steel to the project site.
- B. Steel Reinforcement Shop Drawings: Comply with ACI SP-066:
 - 1. Placing Drawings that detail fabrication, bending, and placement.
 - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
 - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M
- B. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:
 - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

1.6 REGULATORY REQUIREMENTS

- A. Except as modified by the requirements specified herein or the details on the drawings, reinforcing steel shall conform to the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 19A - Concrete.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver reinforcement bundled and tagged to identify placement and certify testing.
- B. Transport reinforcing steel to the construction site, store and cover in a manner that will ensure that no damage occurs to it from moisture, dirt, grease, or other cause that might impair bond to concrete. Store a sufficient supply of approved reinforcing steel on the construction site at all times to ensure that there will be no delay of the construction. Maintain identification of steel after bundles are broken.

1.8 COORDINATION

- A. Review architectural, structural, mechanical, and electrical drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed for #4 bars and larger; Grade 40 for #3 bars and smaller.
- B. Low-Alloy Steel Reinforcing Bars for bars to be welded: ASTM A706/A706M, deformed.

- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Welding Electrodes: AWS A5.1-04, grade E70XX for welding grade 40 reinforcing steel, and AWS A5.5-06 E90XX for welding grade 60 reinforcing steel.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
- C. Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain or Galvanized.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement in accordance with the details indicated. Where specific details are not indicated or noted, comply with the applicable requirements of CRSI's "Manual of Standard Practice," CBC Title 24 Part 2, Chapter 19A; IBC Standard 19-1; and ACI SP-66-04.
- B. Bend, cut, and place bars accurately, as indicated. Bend bars cold; heating of bars will not be permitted. Do not bend or straighten bars in any manner that will injure the material.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. General: Comply with applicable requirements of CCR Title 24 Part 2, ACI 315, and CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - 2. Lap edges and ends of adjoining sheets at least one mesh spacing.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.
- D. Reinforcing Supports: Support bars and welded wire fabric larger than 8-gage on metal chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. Support legs of accessories in forms without embedding in form surface. Space chairs and accessories in conformance with CRSI's "Recommended Practice for Placing Bar Supports". No wood will be permitted inside forms. Precast concrete cubes may be used to support reinforcing for footings and slabs on grade.
- E. Placing and Tying: Set reinforcing in place, space, and securely tie at splices and at crossing points and intersections in the position indicated, or as directed. Point ends of wire away from forms.
- F. Spacing: Space bars as indicated. Where not indicated, the clear spacing for main longitudinal column reinforcement shall be not less than 1.5 times the nominal bar diameter, or 1-1/2 inches, or 1-1/3 times the maximum size aggregate, whichever is greater. For other parallel bars, where spacing is not indicated, the minimum clear spacing shall not be less than the nominal bar diameter, or one inch, or 1-1/3 times the maximum size aggregate, whichever is less. The clear distance limitations above also apply between the bars being spliced at a contact lap splice and adjacent bars.
- G. Splices: Except for temperature bars in slabs and horizontal wall reinforcing, no splicing will be allowed for reinforcing bars unless detailed locations are indicated, or approval is given. Stagger lapped splices for horizontal wall reinforcing and slab temperature bars by the required minimum lap splice length. Wherever possible, stagger splices of adjacent bars.
- H. Dowels: Securely tie dowels in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, add a No. 3 minimum to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted. Protect dowels extended for future construction from weather exposure. Compliance with safety law requirements for extended dowels is required.
- I. Cleaning: At time of concrete placement, clean reinforcement free of coatings that would impair bond to concrete, otherwise clean reinforcing by sandblasting as required.
- J. Welding: Welding of reinforcing steel will not be permitted except as specifically approved or detailed. Welding shall comply with IBC Standard 19-2 and AWS D1.4 using low hydrogen electrodes. Before welding, determine weldability of reinforcing bars by a laboratory chemical analysis.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.

2. Continue reinforcement across construction joints unless otherwise indicated.
 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.
- 3.4 INSTALLATION TOLERANCES
- A. Comply with ACI 117.
- 3.5 FIELD QUALITY CONTROL
- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - B. Inspections:
 1. Steel-reinforcement placement.
 2. Steel-reinforcement welding.
 - C. Notify the District Inspector at least 2 working days ahead of each concrete pour and do not place any concrete until all reinforcing steel has been installed and approved by the Inspector. Complete all reinforcing in every way by the end of the working day before concrete placing. Testing and inspections are specified in Section 01 45 00.
- 3.6 DEFECTIVE WORK
- A. The following reinforcing steel construction will be considered defective and removed and replaced at no additional cost to the Owner.
 1. Bars with kinks or bends not indicated.
 2. Bars damaged by bending or straightening.
 3. Bars heated for bending.
 4. Reinforcement not placed in accordance with the drawings or specifications.

END OF SECTION

03/12/19

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 03 11 00 "Concrete Forming" for concrete formwork.
 - 2. Section 03 20 00 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
 - 3. Section 03 35 43 "Polished Concrete Finishing" for concrete floors scheduled to receive a polished concrete finish.
 - 4. Section 07 26 16 "Below Grade Vapor Barrier".
 - 5. Section 32 13 13 "Landscape Site Concrete" for concrete pavement and walks.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
- B. Water/Cement Ratio (W/C Ratio): The ratio by weight of water to cementitious materials.

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Concrete Institute (ACI)
American Society for Testing and Materials (ASTM International)

1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Portland cement.
 - 2. Aggregates.
 - 3. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

4. Curing materials.
5. Joint fillers.
6. Sealer.
7. Chemical hardener.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

E. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

B. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Except as modified by the requirements specified herein or the details indicated, concrete construction shall conform to the 2016 California Building Code (CBC) Title 24 Part 2 Chapter 19A - Concrete.
 2. CalGreen Requirements: Materials shall comply with environmental requirements of 2016 California Building Code (CBC) Title 24 Part 11.
 - a. The quantity of volatile organic compounds (VOC) used in materials shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.
 - B. Installer Qualifications: A qualified installer who employs Project personnel qualified as a ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.
 1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
 - C. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Comply with ASTM C94/C94M and ACI 301.
- 1.8 FIELD CONDITIONS
- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 3. Do not use frozen materials or materials containing ice or snow.
 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
 - B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
2. Obtain aggregate from single source.
3. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: Conform to ASTM C150, Type II. The cement used in the work shall correspond to that on which the selection of concrete proportions was based.
2. Fly Ash: ASTM C618, Class F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Where aggregates contain reactive substances, low alkali cement shall be used in all concrete. Low alkali cement shall not contain more than 0.6 percent total alkali when calculated as sodium oxide as determined by the method given in ASTM C114.

C. Pozzolan: ASTM C618, Type F. Limit use of pozzolan to not more than 15 percent of cement content by weight.

D. Normal Weight Aggregates: ASTM C33 coarse aggregate or better, graded. Provide aggregates from a single source. Comply with CCR Title 24 Part 2, Sec. 1903A.5.

1. Alkali-Silica Reaction: Comply with the following:
 - a. Use ASTM C227 to determine alkali reactivity of the aggregates as specified therein, the alkali reactivity shall be "innocuous" as determined by ASTM C289.
2. Coarse Aggregate: Clean, hard, crushed rock or washed gravel, free from organic materials or soft or friable materials, containing not more than 2 percent by weight of shale or cherty material and not more than 15 percent by weight of elongated fragments.
3. Maximum Coarse-Aggregate Size: As indicated on Structural Drawings.
4. Fine Aggregate: Washed clean, uniformly screen graded, and containing not more than 2 percent by weight of deleterious materials such as shale, schist, alkali, clay lumps, earth, loam, mica or similar materials. Uniformly grade fine aggregate from fine to coarse.

E. Lightweight Aggregates: ASTM C330; 1/2-inch nominal maximum aggregate size.

F. Admixtures: ACI-318, 26.4.1.4. Admixture shall be subject to acceptance by the Architect and Division of the State Architect (DSA) as to type and amount used. Admixtures shall not contain intentionally-added chlorides.

1. Air-Entraining Admixture: ASTM C260. Acceptable products, or equal:

BASF Corporation; MasterAir Series
Cormix, Inc.; Air-Tite
Euclid Chemical Co.; Air-Mix

W.R. Grace & Co.; Darex AEA
Sika Corp.; AER

2. Water Reducing Admixture: ASTM C494, Type A. Acceptable products, or equal:

Cormix, Inc.; PSI N
Euclid Chemical Co.; Eucon WR 75
W.R. Grace & Co.; WRDA
BASF Corporation; MasterPozzoloth Series or MasterPolyheed Series
Sika Corp.; Plastocrete 161
3. Retarding Admixture: ASTM C494, Type B. Acceptable products, or equal:

BASF Corporation; MasterSet R Series or MasterSet DELVO Series
4. Accelerating Admixture: ASTM C494, Type C. Acceptable products, or equal:

BASF Corporation; MasterSet AC 534 or MasterSet FP 20.
5. Water Reducing and Retarding Admixture: ASTM C494, Type D. Acceptable products, or equal:

BASF Corporation; MasterSet R Series or MasterSet DELVO Series.
6. Water Reducing and Accelerating Admixture: ASTM C494, Type E. Acceptable products, or equal:

Cormix, Inc.; Gilco Accelerator
Euclid Chemical Co.; Accelguard 90
W.R. Grace & Co.; Duraset
BASF Corporation; MasterSet FP 20.
7. High Range Water Reducing Admixture: ASTM C494, Type F. Acceptable products, or equal:

Cormix, Inc.; PSI Super
Euclid Chemical Co.; Eucon 37
W.R. Grace & Co.; Daracem
BASF Corporation; MasterRheobuild 1000, MasterGlenium Series or PS 1466.
Sika Corp.; Sikament 300
8. Workability-Retaining Admixture: ASTM C494, Type S. Shall retain concrete workability without affecting time of setting or early-age strength development. Acceptable products, or equal:

BASF Corporation; MasterSure Z 60.
10. Corrosion-Inhibiting Admixture: Shall be a nominal 30 percent solution of calcium nitrite or an amine/ester-based organic corrosion-inhibiting admixture. Acceptable products, or equal:

BASF Corporation; MasterLife CI 30 or MasterLife CI 222.
11. Shrinkage-Reducing Admixture: ASTM C494, Type S. Acceptable products, or equal:

BASF Corporation; MasterLife SRA 20 or MasterLife CRA 007.

- G. Water Used in Mixing Concrete: ASTM C94/C94M, potable, clean and free from deleterious amounts of acid, alkalis, organic or other materials.

2.3 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
- B. Curing Compound: Types as follows subject to the limitations specified elsewhere in this Section:

1. Non-film Forming Type: Clear, water-based solution that penetrates below the concrete surface to react with free lime to seal, harden and dust proof concrete surfaces. When tested in accordance with ASTM C156, compound shall restrict the loss of water to not more than 0.55 kg per square meter. Acceptable products, or equal:

Burke Corp.; Res-X Silicate
Dayton-Superior; Day-Chem Sil-Cure (J13)
Euclid Chemical Co.; Cure & Hard
W. R. Meadows; Med-Cure
Nox-Crete, Inc.; Bro-Cure
Sonneborn Building Products; Sonosil

2. Dissipating Resin Type: Water based, resin compound containing no wax, paraffin, gum or oil, designed to cure fresh concrete and complying with ASTM C309, Type I-D, Class B. Acceptable products, or equal:

Burke Corp.; Aqua Resin Cure
Euclid Chemical Co.; Kurez VOX
W. R. Meadows; 1100 Clear
Nox-Crete, Inc.; Resin Cure E
Symons Corp.; Resi-Chem Clear Cure
Sonneborn Building Products; Sonocure

3. Pigmented Type: Water based blend of pure waxes, polymers, additives, and alkali resistant pigments as recommended by the manufacturer of the coloring admixture. When tested in accordance with ASTM C156, compound shall restrict the loss of water to not more than 0.55 kg per square meter. Acceptable products, or equal:

L.M. Scofield Co.; Lithochrome Colorwax, Water Base
Admixtures, Inc.; Colorfull Cure-Sealer

4. Curing Sealer: Water based acrylic resin compound containing not less than 12 percent solids, designed to cure, seal and dustproof concrete floors, complying with ASTM C309, Type I, Class B. Acceptable products, or equal:

Burke Corp.; Spartan Cote WB
Dayton-Superior; Safe Cure & Seal (J-18)
Euclid Chemical Co.; Aqua-Cure VOX
W. R. Meadows; Vocomp-20
Nox-Crete, Inc.; Cure & Seal 1200E
Symons Corp.; Cure & Seal 12% Emulsion
Sonneborn Building Products; Kure-N-Seal WB

2.4 RELATED MATERIALS

- A. Expansion Joint Filler: Premolded, of sizes and thicknesses indicated, meeting the requirements of ASTM D1751.
- B. Expansion Joint Sealing Compound: Expansion joint sealant and backer rod is specified in Section 07 92 00.
- C. Below Grade Vapor Barrier: As specified in Section 07 26 16.
- D. Abrasive Aggregate: Factory graded and packaged fused aluminum oxide grits or crushed emery containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Material shall be rust-proof, non-glazing and unaffected by freezing, moisture and cleaning materials.
- E. Drilled Anchors: Acceptable products, or equal:

Hilti; Kwik-Bolt TZ Expansion Anchors (ICC Report No. ESR-1917)
- F. Epoxy Adhesive Anchoring System: Basis-of-Design Product:

Hilti HIT-RE 500v3 Safe Set System with Hilti Hollow Drill Bit and Vacuum with HAS-E Threaded Rod, per ICC ESR-3814).

The HIT-RE 500 V3 adhesive anchoring system is an injectable two-component epoxy adhesive. The two components are kept separate by means of a dual-cylinder foil pack attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

2.5 REPAIR MATERIALS

- A. Leveling Compound: Cementitious, single component, non-shrink, self-leveling underlayment for concrete floors. Acceptable products, or equal:

Ardex; V-800
 Burke Corp.; Flo-Tru
 Dayton-Superior; Levelayer II
 Euclid Chemical Co.; Flo-Top
 Symons Corp.; Floor Top
 Sonneborn Building Products; Sonoflow

2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Concrete Proportions and Properties:
 - 1. Minimum Concrete Strengths at 28 Days: As indicated.
 - 2. Maximum Slumps: As indicated, or 4-inches for toppings on metal deck, 4-inches for slabs, footings and other horizontal members, 4-inches for walls, columns and other vertical members.
 - 3. Maximum Water-to-Cement Ratios: As indicated.

4. Maximum Size Aggregate: In no case shall the maximum aggregate size used exceed one fifth of a member's thickness, one third of the depth of slabs, nor three fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. In columns and piers it shall not exceed 2/3 of the clear distance between reinforcement. In addition, it shall never exceed the size indicated for the following:
 - a. Slabs 6 inches and less in thickness: 1-inch.
 - b. Walls less than 8 inches in thickness: 1-inch.
 - c. Toppings over Steel Pan Stair Systems, and Metal Deck: 3/8-inch.
5. Admixtures: Admixtures shall be added in accordance with the manufacturer's instruction.
 - a. High range water reducing accelerating admixtures may be used, at the Contractor's option, to improve workability and finishing of low slump concrete mixes and to produce flowable concrete for pumping. Dosages shall be determined by the manufacturer after testing of cements and aggregates to be used.
 - b. Water reducing admixtures may be used, at the Contractor's option, to improve workability and finishing of low slump concrete mixes.
 - c. Water reducing, accelerating admixtures may be used, at the Contractor's option, to achieve early strength for earlier form removal.
 - d. Air entraining admixture may be used, at the Contractor's option, to improve workability of low slump concrete mixes.
- C. Grout: One part portland cement and 2 parts fine aggregate, by volume. Grout shall be of a consistency suitable for the intended purpose and shall be used immediately after mixing. Grout used under minor bearing plates shall be "drypack" and shall be rammed into place. Small quantities of grout may be mixed by hand, but grout requiring 1/2 sack of cement, or more, per batch shall be machine mixed.

2.7 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for footings and grade beams.
 1. Exposure Class: ACI 318 F0, S0, W0, C0 .
 2. Minimum Compressive Strength: 3000 psi at 28 days.
 3. Slump Limit: 4 inches.
- B. Class B: Normal-weight concrete used for interior slabs-on-ground.
 1. Exposure Class: ACI 318 F0, S0, W0, C0.
 2. Minimum Compressive Strength: 3000 psi at 28 days.
 3. Slump Limit: 4 inches.
- C. Class C: Normal-weight concrete used for exterior paving.
 1. Exposure Class: ACI 318 F1, S0, W0, C0.
 2. Minimum Compressive Strength: 2500 psi at 28 days.
 3. Slump Limit: 4 inches.
- D. Class D: Light-weight concrete fill over metal deck.
 1. Exposure Class: ACI 318 F0, S0, W0, C0.
 2. Minimum Compressive Strength: 3000 psi at 28 days.

3. Slump Limit: 4 inches.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and ASTM C 1116/C 1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 2. Use ready mixed concrete, mixed and transported in accordance with ASTM C94.
 3. Retempering: Mix concrete only in quantities for immediate use. Discard concrete which has set, do not retemper.
 4. Indiscriminate addition of water to increase slump is prohibited. When concrete arrives at the project with slump below that suitable for placing, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. Incorporate the water by additional mixing equal to at least half of the total mixing required. Accompany addition of water above that permitted by the limitation of water-cement ratio by a quantity of cement sufficient to maintain the proper water-cement ratio. Obtain approval.
 5. In the event concrete is mixed at a central batching plant, the delivery shall be arranged so that intervals between batches are kept at a minimum, and in any event not more than 30 minutes. Trucks shall be in first class condition and kept in constant rotation during delivery. No water shall be added during transit or at the job without specific instructions from the civil engineer responsible for the mix design. Concrete shall be placed within 90 minutes after addition of water and admixtures.

2.9 SOURCE QUALITY CONTROL

- A. General: Submit mill tests and manufacturer's certification of compliance with ASTM Specifications to the Inspector in lieu of testing of cement and aggregate analysis.
- B. Mix Designs:
 1. Mix designs shall be made by the contractor's concrete supplier under the supervision of a California Registered Civil Engineer, who shall determine mix proportions to fulfill the specified requirements for strength, aggregate size and workability of concrete, and such designs shall be used in proportioning all structural concrete. Mix designs shall bear the signature and seal of the California Registered Engineer. Two copies of the mix designs shall be filed with the Architect for record purposes only, not for review or approval.
 2. Make mix designs in accordance with ACI 318 Sec. 26.4.2. The Owner in accordance with Section 01 45 00 will pay costs for mix design.
 3. Cover and clear distances between reinforcing bars shown on the drawings shall be considered in determining the aggregate size for mix designs, which may result in an aggregate size smaller than the maximum aggregate size stipulated elsewhere in this specification.
 4. A list specifying the intended usage of each mix design shall be clearly shown as part of the designs.

5. The maximum water-cement ratio for concrete intended for use in interior slabs-on-grade shall be 0.45.
 6. Mix designs shall be reviewed and approved by the Owner's Testing Laboratory for compliance with the contract documents, with "NO EXCEPTIONS TAKEN".
- C. Owner's Testing Laboratory shall provide continuous inspection at concrete batch plant, unless the requirements of CCR, T24 Sec. 1705A.3.3 are met.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.3 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions. Refer to Section 07 26 16 "Below Grade Vapor Barrier."

3.4 JOINTS

- A. Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
1. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for slabs in the middle third of spans.

5. Locate horizontal joints in walls and columns at underside of floors and slabs, and at top of footings or floor slabs.
 6. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated.
 2. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify the Owner's Inspector and DSA at least 2 working days in advance of the placing of any concrete.

- C. Geotechnical Engineer shall inspect soil bottoms for footings and slabs before placing concrete.
- D. Before placing concrete, forms shall be thoroughly inspected. Remove wood chips, dirt, etc., take out temporary bracing and cleats, box openings for pipes, etc., secure forms in their correct position and make tight, secure reinforcement, anchors, and embedded items in their proper places. Concrete which may be on the forms or reinforcement, and which is set and dry, shall be cleaned off and the forms and steel washed off before proceeding. Remove water and all foreign matter from forms and excavations.
- E. Subgrade Preparation: Before concrete floor slabs on grade are poured, place vapor barrier over prepared subgrade, lapping all joints not less than 4-inches. Seal all joints and punctures in vapor barriers with pressure sensitive tape. Cover vapor barrier with a 2-inch thick layer of sand.
- F. Surface Preparation: Before new concrete is deposited against hardened concrete, and before masonry is placed on concrete, remove all incrustations and laitance from forms, reinforcing, and surface of hardened concrete. If the surface mortar and laitance of the first concrete pour has not been completely removed by water blasting, the hardened concrete surface shall receive a sandblast treatment exposing the coarse aggregate, to 1/4-inch amplitude. Surfaces that are to receive drypack shall also be prepared as herein specified.
- G. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- H. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- I. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.

7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

J. Handling and Depositing:

1. Concreting, once started, shall be carried on as a continuous operation until the section of approved size and shape is completed.
2. Handle concrete as rapidly as practicable from the mixer to the place of final deposit by methods that prevent the separation or loss of ingredients. Deposit concrete as neatly as practicable, in its final position to avoid rehandling or flowing.
3. Concrete shall not be dropped freely where reinforcing will cause segregation, nor shall it be dropped freely more than 4-feet. Concrete shall be deposited to maintain a plastic surface approximately horizontal.
4. Do not deposit concrete that has partially hardened in the work. Concrete shall not be retempered nor used after having stood 15 minutes after leaving the truck or mixer.

K. Vibrating and Compacting:

1. Thoroughly consolidate all concrete and compact by suitable means during the operation of placing and depositing. Thoroughly work all concrete around reinforcement, embedded items, and into the corners of the forms. Concrete against forms shall be thoroughly vibrated. Use internal vibrators under experienced supervision and keep out of contact with reinforcement and wood forms.
2. Vibrate close to the forms but do not continue at one spot to the extent that large areas of grout are formed or the heavier aggregates are caused to settle. Take care not to disturb concrete that has taken its initial set.

L. Flatwork:

1. Set edge forms and intermediate screed strips accurately to produce the designed elevations and contours in the finished surface, and sufficiently strong to support vibrating bridge screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. Align concrete surface to the contours of screed strips by the use of strike-off templates or approved compacting type screeds.
2. When the formwork is cambered, set screeds to a like camber to maintain the proper concrete thickness.
3. Locate and detail joints in slabs on grade as indicated.
4. Thoroughly consolidate concrete slabs. Use internal vibration along the bulkheads of slabs on grade. Obtain consolidation of slabs and floors with vibrating bridge screeds, roller pipe screeds, or other approved means. Concrete to be consolidated shall be as dry as practical and the surfaces thereof shall not be manipulated before the finishing operations.

3.6 FINISHING FORMED SURFACES

- A. General: Provide sacked or rubbed finishes where indicated. Provide sacked finish where no other finish is indicated. As-cast finish not acceptable.
- B. As-Cast Surface Finishes: Not Used.

C. Smooth-Formed Finish:

1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
2. Repair and patch tie holes and defects.
3. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
4. Apply to concrete surfaces to receive a rubbed finish.

D. Sacked Finish:

1. Remove fins, rough spots, stains and hardened mortar by carefully rubbing with a fine abrasive stone to a smooth even surface.
2. Remove excess form sealer by carefully scrubbing surface with 5 to 10 percent solution of muriatic acid.
3. Fill holes or irregular surfaces.
4. Apply a slurry proportioned one part cement to 1-1/2 parts sand, passing a No. 16 sieve, by damp loose volume, mixed with sufficient water to form a grout having the consistency of thick paint.
5. Before applying slurry to surfaces, dampen concrete sufficiently to prevent water absorption.
6. Spread slurry over surfaces with a clean sponge rubber float to completely fill holes and imperfections.
7. Float surface vigorously, and while slurry is still plastic remove excess grout.
8. Allow to dry then rub with burlap to completely remove dry grout so that no visible grout film remains.
9. Complete the entire cleaning operation for any area the day it is started.

E. Smooth-Rubbed Finish:

1. Perform no later than one day after form removal.
2. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
3. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.

F. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.

3. Apply float finish to surfaces to receive trowel finish, subfloors for ceramic and quarry tile, and for interior stair treads and landings.
 - a. Tolerances for floors indicated to receive thin set ceramic tile applications shall not exceed 1/8-inch in 12-feet.
 - b. Tolerances for all other floors shall not exceed 1/4-inch in 12-feet.
 - c. Finish floors that do not meet specified tolerances shall be leveled to within the specified tolerances using a leveling compound.
- C. Trowel Finish:
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 4. Do not add water to concrete surface.
 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 6. Apply a trowel finish to interior concrete finish floors exposed to view, and subfloors for resilient flooring and carpet.
 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) For Slabs with Carpet: Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
 - 2) For Slabs with Thin Floor Coverings: Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.
 - 3) For Polished Concrete Floors: Refer to Section 03 35 43 "Polished Concrete Finishing" for F_F and F_L tolerances.
 - b. Suspended Slabs:
 - 1) For Slabs with Carpet: Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
 - 2) For Slabs with Thin Floor Coverings: Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.
 - 3) For Polished Concrete Floors: Refer to Section 03 35 43 "Polished Concrete Finishing" for F_F and F_L tolerances.
- D. Edge and Joint Finish: Use standard tools to produce rounded edge corners and intermediate line scoring.
- E. Mark-Off Lines: Form mark-off lines with curved edging tool, neat and true to line, uniform throughout. Conform to markings indicated.
- F. Concrete Sealer: All concrete floors not indicated in the schedule to receive other finish shall receive 2 coats of sealer specified herein. Spray apply in perpendicular directions. First coat shall be applied as a curing compound. Apply final coat just prior to occupation of buildings. Before applying final coat, remove dirt, dust, oil, grease, asphalt and other foreign matter.

- G. Chemical Hardener: Remove dirt, dust, oil, grease, asphalt, paint and other foreign matter from the concrete surface. Damp cure concrete, do not cure with curing compound. Apply hardener using 3 coats allowing 24 hours between coats. Apply first coat at 1/3 strength, second coat at 1/2 strength and final coat at 2/3 strength. Use manufacturer's recommended application rates. After final coat is dry, remove surplus hardener by scrubbing and mopping with water.
- H. Finishes for exterior concrete paving construction are specified in Section 32 13 13.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
 - 1. Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated.
 - 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 - 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: As indicated.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
 - 1. Cast-in inserts and accessories as shown on Drawings.
 - 2. Screed, tamp, and trowel finish concrete surfaces.

3.9 CONCRETE CURING

- A. Protect freshly deposited concrete from premature drying and excessively hot or cold temperatures,
 - 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a. Lap edges and ends of absorptive cover not less than 12-inches.
 - b. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b. Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a. Water.
 - b. Continuous water-fog spray.
 - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a. Lap edges and ends of absorptive cover not less than 12 inches.
 - b. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b. Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a. Water.
 - b. Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a. Lap edges and ends of absorptive cover not less than 12 inches.
 - b. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a. Water.
 - b. Continuous water-fog spray.
- d. Floors to Receive Urethane Flooring:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches (150 mm) and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
- e. Floors to Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer, unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

f. Floors to Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.10 TOLERANCES

- A. Conform to ACI 117.

3.11 JOINT FILLING

A. Expansion Joints:

1. General: Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
 - a. Defer joint filling until concrete has aged at least one month.
 - b. Do not fill joints until construction traffic has permanently ceased.
2. Position filler against forms, adjacent concrete slabs, and other construction.
3. Pre-score top edge or place expansion joint void-cap over filler. Install filler with top edge at or slightly below final concrete surface.
4. After concrete has cured apply joint sealant flush with concrete surfaces.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

- C. Any concrete which is not formed as shown on the drawings, or for any reason is out of alignment, or is not true, or is not plumb or level, or is not in plane, or shows a defective surface, or is otherwise not in true and continuous form or is structurally defective, shall be considered as not conforming with the intent of this specification.

- D. Contractor shall remove such concrete from the job and replace with new work, at no extra cost to the Owner, unless Architect grants permission to patch defective area in accordance with the following procedures. Do not consider permission to patch any such area as a waiver of Architect's right to require complete removal of defective work if patching does not, in his

opinion, satisfactorily produce or restore required quality and appearance of surface. Defects impairing strength of concrete will require special repairs or removal as directed by the Architect.

E. Patching Appearance Defects:

1. Inspection: After removing entire formwork assemblies, inspect concrete surfaces and patch tie holes, pour joints, voids, stone pockets, and such other defective areas as are permitted by Architect to be patched.
2. Procedure: Where necessary, chip away defective areas to depth of not less than 1-inch with edges perpendicular to surface, with no feather edges. Wet area to be patched and a space at least 6-inches wide entirely surrounding it, to prevent absorption of water from patching mortar. Place grout of equal parts portland cement and sand with sufficient water to produce a brushing consistency. Brush well into surface, and then follow immediately with patching mortar.
3. Use patching mortar of same material and of approximately same proportions as used for concrete, except omit coarse aggregate, and do not mix richer than 1 part cement to 3 parts sand. Use as little mixing water as is consistent with requirements of handling and placing.
4. Compact mortar into place and screed off so as to leave patch slightly higher than surrounding surface. Then leave patch undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. Finish the patch in such a manner as to match adjoining surface, after striking off the patch with a straightedge spanning the patch and held parallel to direction of form marks.

F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare testing and inspection reports. Owner's testing and inspecting agency to provide tests and inspections in accordance with CCR, T24, Sec. 1705A.3 and Table 1705A.3; and Sec. 1910A.

1. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
2. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports shall include reporting requirements of ASTM C31/C31M and ASTM C39/C39M, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.

- 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. of concrete or fraction thereof, or not less than once for each 2,000 square feet of surface area for slabs or walls, of each concrete mixture placed each day, per ACI 318 Sec 26.12.2.1 and 2016 CBC 1905A.1.16.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M;
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M;
 - a. One test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

- a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M.
 - a. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days
 - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is ≤ 5000 psi.
 10. Test results shall be reported in writing to Architect, IOR, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests:
 - a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.14 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

3.15 DEFECTIVE WORK

A. Remove and replace defective concrete construction at Contractor's expense.

END OF SECTION

04/01/19

SECTION 03 35 07

CONCRETE VAPOR CONTROL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Fluid applied vapor control treatment: Vapor-Proof all concrete floor slabs scheduled to receive carpeting, wood flooring, or clear sealer. Provide substrate suitable for installation of flooring by other sections to ensure provision of full warranty and service life of those finishes.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 03 33 00 - Cast-In-Place Concrete: Concrete Substrate.
 - 2. Section 09 68 13 - Tile Carpeting.

1.2 REFERENCES

- A. The editions of standards and specifications published by the following organizations, and referenced herein, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. ASTM International:
 - 1. ASTM E96 – Standard Test Methods For Water Vapor Transmission of Materials.
 - 2. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - 3. ASTM F1869 – Standard Test Method For Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 4. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-Situ Probes.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Specified Product:

1. Product Data: Technical data sheet.
2. Installation methods: Indicate procedures and process.
3. Mixing data.
4. Installer Certificate: Manufacturer's acceptance of applicator.

C. Alternate Products:

1. Product Data: All products being used in the assembly of the control coating system.
2. Laboratory Testing: Current independent laboratory reports. Reports shall be no greater than 2 years of age. Older test reports are not acceptable.
3. Installer Certificate: Manufacturer's approved applicator's certificates.
4. Warranty: Manufacturer's standard warranty certificate, including any and all exclusions.
5. Insurance Certificate: Submit manufacturer's product liability insurance certificate.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Local manufacturer specializing in two-component water based products meeting LEED Low-Emitting Coating requirements.
- B. Installer Qualifications: Company approved and supervised for the application of manufacturer's product.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Monitor weather conditions prior to application. Do not apply when rain, dew point or temperatures of less than 40 degrees are expected during concrete placement and within 24 hours after product application.
- B. Optimum temperature conditions: 50 to 95 degrees during application.
- C. Do not apply when humidity levels are 50% RH and rising since this may inhibit the curing process.

1.06 LIMITATIONS

- A. Do not use any other curing compounds, sealers, plastic sheeting or chemicals after the application of Synthetic10-TR.
- B. Standard machine troweling is recommended for proper application, never over finish or burnish the concrete surface.

1.07 WARRANTY

- A. Section 01 78 36 – Warranties: Requirements for warranties.
- B. Product shall restrict water vapor emission rates to within flooring manufacturer's requirements. In the event flooring systems are damaged by concrete originated water vapor emission, manufacturer shall repair and/or replace damaged product at no cost

to Owner, within a 15-year period after date of installation.

-
- C. Manufacturer shall maintain product liability insurance in the amount of \$6,000,000 per occurrence prior to, during and after application process.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Synthetics International www.SyntheticsIntl.com Phone: (866) 646-0356.
 - 1. Basis-of-Design Product: Synthetic10-TR. Synthetic10-TR is a two-component water-based additive to reduce vapor emission levels in freshly-poured concrete floors. The special chemical components, water and fine epoxy resins mix easily with fresh concrete paste or may be mechanically troweled to the concrete surface as a curing replacement. Each application improves the product's penetration and surface density. Application replaces traditional curing, sealing and water curing methods.
 - 2. Synthetic10-TR will maintain the concrete's natural appearance and may be sealed, coated and covered with a wide range of floor primers, coatings and overlays.
- B. Alternate Manufacturers: None identified.

2.02 CONCRETE VAPOR CONTROL TREATMENT

- A. PHYSICAL PROPERTIES – SYNTHETIC10-TR
 - 1. Water Vapor Transmission – WRT:
 - a. ASTM E96 Grains/ft²/hr of less than 1.0.
 - b. ASTM E96 Grams/h · m² of less than 0.7.
 - 2. Water Vapor Permeance – WVP:
 - a. ASTM E96 Perms (inch-pounds) of less than 2.4.
 - b. ASTM E96 Grams/Pa · s · m² x 10⁻⁸ of less than 13.6.
 - c. ASTM E96 Nanograms/ Pa · s · m² of less than 136.3.
 - 3. Green Attributes:
 - a. Contains zero hazardous air pollutants (HAP's).
 - b. EPA Method 24 VOC content of less than 50 g/liter.
 - c. Reduces Indoor Air Pollution, contains no Formaldehyde, no Formaldehyde Precursors and no Carcinogens.
 - 4. Indoor Air Quality Contributions: The product contributes to LEED Green Building Rating System, developed by the U.S. Green Building Council (USGBC). The product reduces the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants under EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify the following conditions prior to application of concrete vapor treatment:
 - 1. Under slab vapor barrier shall meet ASTM F1745 Class A requirements.
 - 2. Concrete to be poured directly on under-slab vapor barrier (no sand layer).
 - 3. Concrete at all grade levels shall have a mix design with water-to-cement ratio of ≤ 0.45 .
- B. Verify items which penetrate substrate to receive treatment are securely installed.
- C. Vapor barrier surfaces shall be free of water, rain, snow and frost. Product to be lapped, taped and securely installed in accordance with ASTM E 1643.

3.02 PREPARATION

- A. Synthetics International recommends specific design components to complement the use of Synthetic10-TR. Consult Synthetics International technical department prior to use.
- B. Schedule concrete pouring process during optimum treatment applications recommendations. Re-schedule pouring process if rain is forecast 24 hours prior to, during or after application of treatment.
- C. Pump, pour and place concrete at all grade levels.
- D. Properly remove all concrete bleed water.
- E. Perform initial mechanical finishing process and hand trowel concrete edges.

3.03 MIXING

- A. Read all technical, mixing and safety data prior to use. Product is mixed 1A:1B in full units only. Partial mixing is not recommended. Mix only enough product that can be used within 60 minutes.

3.04 APPLICATION – SYNTHETIC10-TR

- A. Concrete is ready for treatment application when the slab can support the weight of a person without leaving footprints of more than 1/8 inch depression and prior to the last mechanical trowel process. Do not apply product into standing water or concrete that is excessively bleeding. Proper surface is damp and no standing water is present.
- B. During the 2nd mechanical trowel process, mix and apply product at 200 square feet per gallon by electric sprayer or approved hand-held pump sprayer to coat a 20 foot long section to form an even WHITE layer.
- C. Immediately mix product into the concrete surface using a walk-behind mechanical trowel machine at low speed. Product shall mix easily into the concrete and form a

slurry. To ensure consistent and proper application rates, position materials around perimeter of the slab.

- D. Avoid over finishing or burnishing concrete with equipment.
- E. Continue application process until the entire substrate is coated at all grade levels.
- F. Proceed with saw cuts and control joint cuts after product cures a minimum of 4 hours.
- G. After cutting process, remove concrete dust and debris by airless sprayer and/or blower.
- H. Re-apply treatment to saw cuts and joints.
- I. Protect surfaces from tradesmen and equipment for 12 to 72 hours after application.
- J. Allow product to cure and harden for 10 days prior to covering.
- K. In areas where finish flooring is to be applied, coat surface with manufacturer's recommended non-porous primer prior to the application of a cement patching product.

END OF SECTION

08/27/18

SECTION 03 35 43

POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Products and procedures for polishing concrete floors.
2. Polished concrete finish for designated slab-on-grade substrates in accordance with specified requirements to produce:
 - a. Aggregate Exposure: Class B. (Refer to Paragraph 3.6.A.1).
 - b. Concrete Appearance Finished Gloss: Level 2. (Refer to Paragraph 3.6.B.1).
3. Polished concrete finish for designated suspended slabs on metal deck substrates in accordance with specified requirements to produce:
 - a. Aggregate Exposure: Class A. (Refer to Paragraph 3.6.A.2).
 - b. Concrete Appearance Finished Gloss: Level 3. (Refer to Paragraph 3.6.B.2).
4. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 03 30 00 "Cast-in-Place Concrete."

B. Related Sections:

1. Section 03 30 00 - Cast-in-Place Concrete.
2. Section 07 92 00 - Joint Sealants.

1.2 DEFINITIONS

- A. Polished Concrete: The act of changing a concrete floor surface, with or without surface exposure of aggregate, to achieve a specified level of appearance as defined by Concrete Polishing Council (CPC).
- B. Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, and polishing a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of appearance as defined by the Concrete Polishing Council (CPC).

1.3 PREINSTALLATION MEETING

- A. Pre-Installation of Concrete Conference: Four (4) weeks prior to placing, conduct conference at Project to comply with requirements of Section 01 31 19 – Project Meetings.
 1. Required Attendees:
 - a. Owner Representative.
 - b. Architect.
 - c. IOR.
 - d. General Contractor, including supervisor.
 - e. Concrete producer.
 - f. Concrete finisher, including supervisor.
 - g. Concrete polisher, including supervisor.
 - h. Technical representative of liquid applied product manufacturers.
 2. Minimum Agenda: Discuss mix design, floor finishing, curing and general practices for, but not limited to, following:

- a. Design Requirements: Applicable requirements in Section 03 30 00 "Cast-in-Place Concrete.
 - 1) Concrete mix design.
 - a) Compressive Strength: 3,000 psi, minimum at 28 days.
 - b) Water to Cement Ratio: 0.45, maximum.
 - c) Fly ash content: 5%, maximum.
 - d) No slag content.
 - e) No evaporation retarder materials.
 - f) Concrete additives.
 - g) Finishing and vibrating for specified aggregate exposure.
 - h) Manufacturer's secondary reinforcement.
 - i) Manufacturer's finishing and conditioning aid.
- 3. Concrete Finishing:
 - a. Floor Flatness (FF and FL) requirements:
 - 1) Achieving specified aggregate exposure.
 - 2) Slab on Grade: Overall FF 60 / FL 40, measured at eight hours after completion of final troweling.
 - 3) Suspended Slabs on Metal Deck with unshored steel beams: Overall FF 25 / FL 15, measured within 72 hours.
 - 4) Restrictions on burnishing surfaces.
 - 5) Hard-Steel Troweled (3 passes) Concrete: No burnishing marks. Finish to ACI 302.1R, Class 5 floor.
- 4. Concrete Curing: Maintain surfaces continuously wet for 7-days.
 - a. Water curing.
 - b. White 90% light reflective curing blanket with fabric face for preventing stains and slab markings.
- 5. Concrete floor protection sequencing to prevent contamination, staining and damage during construction.
- 6. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.4 REFERENCES

A. American Concrete Institute (ACI):

- 1. ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. American National Standards Institute:

- 1. ANSI B101.3 -Test Method for Measuring Wet Dynamic Coefficient of Friction (DCOF) of Common Hard Surface Floor Materials.

C. ASTM International:

- 1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- 2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- 3. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- 4. ASTM D4039 – Standard Test Method for Reflection Haze of High-Gloss Surfaces.
- 5. ASTM D5767 – Standard Test Method for Instrumental Measurement of Distinctness-of-Image (DOI) Gloss of Coated Surfaces.
- 6. ASTM E 430 – Standard Test Methods for Measurement of Gloss of High-Gloss Surfaces by Abridged Goniophotometry.

7. ASTM F 710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 8. ASTM F 1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- D. Terminology: As defined by Concrete Polishing Council (CPC) Glossary (www.ascconline.org).
1. Definitions.
 2. Polished Concrete Aggregate Exposure Chart.
 3. Polished Concrete Appearance Chart.

1.5 ACTION SUBMITTALS

- A. General: Submit listed action submittals in accordance with Contract Conditions and Section 01 33 00 - Submittals.
- B. Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
1. Technical data for each product to be applied.
 2. Preparation and concrete grinding procedures.
- C. Shop Drawings: Indicate information on shop drawings as follows:
1. Typical layout including dimensions and floor grinding schedule.
 2. Plan view of floor and joint pattern layout.
 3. Areas to receive polished floors.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Manufacturers approval of applicator certificate.
- B. Slip Resistance: Tile Council of North America dynamic coefficient of friction (DCOF) of polished concrete referenced surfaces using the test method in ANSI A137.1 section 9.6.
- C. Low-Emitting Certificates: Polishing manufacturer's third party laboratory testing for CDPH low-emitting material compliance for liquid applied products.
- D. Post-installation testing results:
1. ASTM D5767 Distinctness-of-Image, %.
 2. ASTM D523 - Standard Test Method for Specular Gloss.

1.7 CLOSEOUT SUBMITTALS

- A. Warranty: Submit warranty documents specified.
- B. Installer: Submit warranty statement or certificate meeting specified warranty.
- C. Maintenance Data: Submit maintenance data for installed products in accordance with Section 01 78 23 – Operation and Maintenance Data.
1. Include:
 - a. Manufacturer's instructions on maintenance renewal of applied treatments.

- b. Protocols and product specifications for joint filing, crack repair and/or surface repair.
- c. Supply 2-gallons of manufacturer's proprietary cleaning solution.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. General Contractor to provide maintenance materials in accordance with Section 01 77 00 – Contract Closeout and Final Cleaning.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

- 1. Company with 5-years of documented installation success in polished concrete floor systems; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
- 2. Manufacturer approved and accepted installer.

B. Manufacturer Qualifications:

- 1. Company with 10-years documented installation history.
- 2. Manufacturer capable of providing field service representation during construction and approving application method.

- C. Sustainability Certifications: Manufacturer's densifier, hardener and protector products to be independently tested for compliance with CDPH low-emitting materials standard.

- D. On-Site Field Mock-up for Aesthetic Purposes: Before performing work of this Section, provide as many field mock-ups as required to verify selections made under submittals and to demonstrate aesthetic effects of polishing. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically approved by Architect in writing.

- 1. Attendance: Owner Representative, General Contractor, Architect, IOR, polishing installer.
- 2. Construct mock-ups to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups using materials indicated for the completed Work.
- 3. Install six (6) weeks prior to commencement of scheduled work.
- 4. Minimum of 10-foot x 10-foot floor samples, located as direct by Architect.
 - a. Slab-on-grade (1st floor) mockup.
 - b. Slab-on-deck (2nd floor) mockup.
- 5. Site Mock-ups shall be representative of work to be expected.
- 6. Approval is for following aesthetic qualities:
 - a. Compliance with approved submittals.
 - b. Compliance with specified aggregate exposure class.
 - c. Compliance with specified appearance level.
 - e. ASTM D5767 Distinctness-of-Image requirements.
 - f. ASTM D4039 Reflection Haze of High-Gloss Surfaces requirements.
- 7. Floor protection of surfaces to prevent contamination and damage.
- 8. Obtain Architect's written approval before starting work on Project.
- 9. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work, when approved by Architect.

1.10 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with 01 60 00 – Materials and Equipment.
- B. Deliver, store and handle in accordance with manufacturer's instructions.
- C. Deliver materials in factory sealed packaging with identification labels and seals intact.
- D. Inspect materials upon delivery and notify manufacturer of damaged, opened and products not approved for use on project.
- E. Store materials protected from weather, sun and damage.

1.11 PROJECT AMBIENT CONDITIONS

- A. Maintain work areas at 45 degrees F to 90 degrees F with relative humidity less than 50%.
- B. Ventilate spaces 24 hours prior to, during and after materials are applied.

1.12 FIELD CONDITIONS

- A. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
 - 1. Prohibit use of markers, spray paint, and soapstone.
 - 3. Prohibit vehicle parking over concrete surfaces.
 - 4. Prohibit pipe-cutting operations over concrete surfaces.
 - 5. Prohibit storage of any items over concrete surfaces for not less than 28 days after concrete placement.
 - 6. Prohibit ferrous metals storage over concrete surfaces.
 - 7. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces.
 - 8. Protect from acids and acidic detergents contacting concrete surfaces.
 - 9. Protect from painting activities over concrete surfaces.
- B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting material application and curing.

1.13 SEQUENCING

- A. Sequence With Other Work: Install materials when work has progressed to allow optimum conditions.

1.14 WARRANTY

- A. Project Warranty: Refer to Section 01 78 36 – Warranties, for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.
 - 1. Commencing on date of Substantial Completion.
- C. Installer Warranty: Five (5) year warranty covering defects and improper installation.

1. Remove and replace materials, including labor at no cost to Owner.

1.15 MAINTENANCE

- A. Comply with manufacturer's written instructions to maintain installed product.

PART 2 - PRODUCTS

2.1 POLISHED CONCRETE FINISHING PRODUCTS

- A. Basis-of-Design Manufacturer: Solomon Colors, Inc.; or equal.
 1. Contact: 4050 Color Plant Road, Springfield, IL 62702 ; Telephone: (800) 624-0261, website: www.lythic.com; E-mail: info@solomoncolors.com
 2. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Proprietary Products/Systems: Materials to comply with CDPH low-emitting requirements.
 1. Hardener, Sealer, Densifier: Proprietary, colloidal water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.
 - a. Basis-of-Design Material: Lythic XL Densifer; or equal.
 2. Cleaning Solution: Proprietary, colloidal silica based cleaner for lubricating surfaces during polishing and maintenance cleaning of final surfaces.
 - a. Basis-of-Design product: Lythic Cleaner; or equal.
 3. Protector: Ready to use, low odor, penetrating colloidal silica co-polymer acrylic for water repellence, stain resistance and improved traction.
 - a. Basis-of-Design product: Lythic Protector; or equal.
 4. Finish: Gloss Levels as specified in paragraph **3.6.B.**

2.2 ACCESSORIES

- A. Pop-Outs, Surface Defects, Repair Material: A product that is designed to repair cracks and surface imperfections. The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.
- B. Crack and Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.
- C. Grout Material: Manufacturer approved cementitious or resin based materials designed for concrete surfaces.
- D. Temporary Protection: Breathable, seamless, spill, stain, impact and water resistant protection board, 20-mil thickness.
 1. MT Commercial by Skudo; www.skudousa.com; or equal.
 2. Ram Board by Ram Board; www.ramboard.com; or equal.

2.3 SOURCE QUALITY CONTROL

- A. Ensure polishing materials are sourced and approved by a single manufacturer.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Review manufacturer's instructions, on-site conditions, on site meeting and mock-up meeting notes and written approvals prior to commencement of work.
- B. Perform all polishing procedures to ensure a consistent visual appearance from wall-to-wall.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify site work has progressed to allow installation.
- B. Concrete Slab Performance Requirements: Verify the following conditions prior to starting:
 - 1. Verify concrete has cured to 28 day 3000 psi strength (minimum)
 - 2. Perform water vapor emission testing in accordance with ASTM F1869. Consult manufacturer when results are above 5.0 lbs. to achieve optimum conditions for color dye application.
 - 3. Surfaces are 3,000 psi strength (minimum).
 - 4. Verify overall floor flatness is a minimum of F_F 50 at ground floor slab-on-grade; and F_F 25 at 2nd floor suspended slabs.
- C. Installation deems acceptance of surfaces and conditions in accordance with Contract Documents for a warranted installation.

3.3 PREPARATION

- A. Cleaning New Concrete Surfaces: Clean surfaces of contaminants to expose absorbent, structurally sound concrete surfaces in accordance with manufacturer's and CPC requirements.
 - 1. Mechanically cut concrete surfaces to meet specified aggregate exposure, using manufacturer's cleaner to reduce surface abrasions and scratches.
- B. Protect equipment and adjacent surfaces from process.

3.4 SURFACE IMPERFECTIONS

- A. Repair surface defects, pop-outs, damage, cracks and surface imperfections to ensure consistent visual appearance.

3.5 HARDENER, SEALER, DENSIFIER

- A. Concrete Slab-on-Grade: Apply two-coats to concrete refusal in accordance with manufacturer's spread rates.
- B. Concrete on Metal Deck: Apply 3 to 4 saturation coats to concrete refusal in accordance with manufacturer's spread rates.

3.6 POLISHING CONCRETE FLOORS

- A. Refer to attachment from Concrete Polishing Council for Polished Concrete Aggregate Exposure Chart.

1. Concrete Slab-on-Grade: Aggregate Exposure Class B – Fine Aggregate: Surface exposure of 85 to 95% fine aggregate and 5 to 15% cement fines and coarse aggregate based on visual observation of the overall area of the polished floor.
 2. Concrete on Metal Deck: Aggregate Exposure Class A – Cement Fines: Surface exposure of 85 to 95% cement fines and 5 to 15% fine aggregate based on visual observation of the overall area of the polished floor.
- B. Refer to attachment from Concrete Polishing Council for Polished Concrete Appearance Chart.
1. Concrete Slab-on-Grade - Appearance Level 2 - Satin (Honed):
 - a. Surface to be free of scratches, abrasions and damage.
 - b. Measurement: Determine the Image Clarity Value, %, and Haze Index of hardener:
 - 1) Image Clarity Value, %: An average value of 10 to 39 measured in accordance with ASTM D5767 prior to the application of sealers.
 - 2) Haze Index: An average value less than 10 measured in accordance with ASTM D4039 prior to the application of sealers.
 - 3) The minimum number of tests distributed across the polished surface should be three, for areas up to 1000 ft² and one additional test for each 1000 ft² or fraction thereof. This applies to both the Image Clarity Value and Haze Index.
 2. Concrete on Metal Deck - Appearance Level 3 - Polished:
 - a. Surface to be free of scratches, abrasions and damage.
 - b. Measurement: Determine the Image Clarity Value, %, and Haze Index of hardener:
 - 1) Image Clarity Value, %: An average value of 40 to 69 measured in accordance with ASTM D5767 prior to the application of sealers.
 - 2) Haze Index: An average value less than 10 measured in accordance with ASTM D4039 prior to the application of sealers.
 - 3) The minimum number of tests distributed across the polished surface should be three, for areas up to 1000 ft² and one additional test for each 1000 ft² or fraction thereof. This applies to both the Image Clarity Value and Haze Index.
- C. Protector:
1. Apply two (2) coats in accordance with manufacturer's instructions.
 2. Burnish to produce maximum appearance and liquid repellent properties.

3.7 ADJUSTMENTS

- A. Re-polish those areas not meeting specified gloss levels appearance testing.
- B. Fill joints flush to surface prior to the start of polishing operations.

3.8 FIELD QUALITY CONTROL

- A. Measure slip resistance in accordance with ANSI B101.3 -Test Method for Measuring Wet Dynamic Coefficient of Friction (DCOF) of Common Hard Surface Floor Materials.
 1. Verify DCOF of 0.42 or greater.

B. Final Floor Testing:

1. Perform a minimum of one (1) test for each 1,000 square feet of polished concrete.
 - a. ASTM D5767 - Distinctness-of-Image.
 - b. ASTM D523 - Standard Test Method for Specular Gloss.
2. Final floors to be smooth with no scratches, abrasions or diamond cut marks in or on concrete surface.
 - a. Re-polish floors to remove scratches at no cost to Owner.
3. Do not proceed with protector application until surfaces are compliant with appearance requirements.

3.9 FINAL CLEANING

- A. Verify cleanup in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- B. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.
- C. Remove material packaging from site and dispose of at appropriate recycling facilities.

3.10 CLOSEOUT ACTIVITIES

- A. Maintenance Training: Manufacturer's Field Representative shall train Owner's designated personnel in proper procedures for using manufacturer's proprietary cleaning solution and maintaining polished concrete floor.

3.11 PROTECTION

- A. Allow floors to dry and cover with manufacturers approved non-staining, temporary floor protection.
 1. Maintain continuous temporary floor protection until Substantial Completion.

END OF SECTION

03/29/19



CONCRETE POLISHING COUNCIL

POLISHED CONCRETE AGGREGATE EXPOSURE CHART

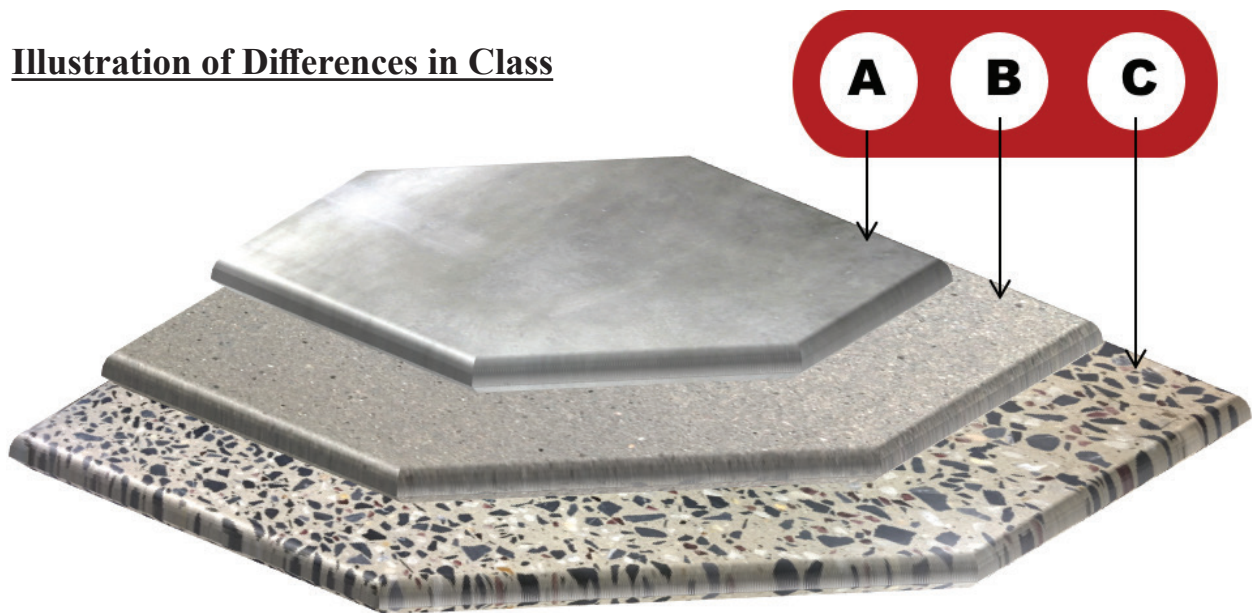
REPLACES CPAA AGGREGATE EXPOSURE CHART

CLASS	NAME	SURFACE EXPOSURE, %
A	Cement Fines	85 – 95 % Cement Fines 5 – 15 % Fine Aggregate
B	Fine Aggregate	85 – 95 % Fine Aggregate 5 – 15 % Blend of Cement Fines and Coarse Aggregate
C	Coarse Aggregate	80 – 90 % Coarse Aggregate 10 – 20 % Blend of Cement Fines and Fine Aggregate

Aggregate exposure class denotes the surface exposure after grinding and polishing operations. The density, size and distribution of the aggregates at the surface depends on the concrete mix design and placing and finishing operations. Floor flatness at the time of grinding and polishing operations is an important consideration in selecting the appropriate aggregate exposure class.

Surface exposure percentages are based on visual observation of the overall area of the polished floor.

Illustration of Differences in Class



Caution: This provides a visual representation of the differences in Class A, B and C. This may not represent the polished concrete in your area as it varies based on aggregate type, gradation, size and distribution. Consult with your CPC Polishing Contractor to see reference samples or mockups.

Contact your Concrete Polishing Council (CPC) contractor or the CPC Hotline at (844) 923-4678 or by email at cpchotline@asconline.org with any questions.



CONCRETE POLISHING COUNCIL

POLISHED CONCRETE APPEARANCE CHART

REPLACES CPAA FINISHED GLOSS CHART

LEVEL	NAME	DISTINCTNESS-OF-IMAGE (DOI) GLOSS	IMAGE CLARITY VALUE, %	HAZE INDEX
1	Flat (Ground)	Images of objects being reflected have a flat appearance.	0 – 9	<10
2	Satin (Honed)	Images of objects being reflected have a matte appearance.	10 – 39	
3	Polished	Images of objects being reflected do not have a sharp and crisp appearance but can be easily identified.	40 – 69	
4	Highly Polished	Images of objects being reflected have a sharp and crisp appearance as would be seen in a near-mirror like reflection. May require grouting.	70 – 100	

■ Distinctness-of-Image (DOI) Gloss

- ◆ DOI is the sharpness of images of objects produced by reflection at a polished surface, sometimes called image clarity.
- ◆ Measurement by Image Clarity Meter (ASTM D5767): The DOI, Image Clarity Value, obtained from this test method, range from 0 to 100 with a value of 100 representing perfect DOI (image clarity).

■ Haze

- ◆ Haze is the cloudiness or milky appearance of images of objects produced by reflection in a polished surface.
- ◆ Measurement by Glossmeter (ASTM D4039): The Haze Index, obtained from this test method, is computed using the numeric difference between the value of specular gloss at 60° and the value of specular gloss at 20°.

■ Measurements for Compliance

- ◆ The Image Clarity Meter and Glossmeter must be calibrated and used in accordance with ASTM D5767 and ASTM D4039.
- ◆ The minimum number of tests distributed across the polished surface should be three for areas up to 1000 ft² and one additional test for each 1000 ft² or fraction thereof. This applies to both the Image Clarity Value and Haze Index.
- ◆ The mean (average) values of the test results should be used to evaluate compliance with this chart.

Contact your Concrete Polishing Council (CPC) contractor or the CPC Hotline at (844) 923-4678 or by email at cpchotline@asconline.org with any questions.

SECTION 03 48 19

PRECAST EPOXY TERRAZZO STAIR TREADS

PART 1 - GENERAL

1.1 SUMMARY

- A. Perform all work required to complete, as indicated by the Contract Documents and furnish all supplementary items necessary, for the proper installation of Precast Epoxy Terrazzo.
- B. Types of Precast Epoxy Terrazzo work included:
 - 1. Precast epoxy terrazzo stair treads and risers, and landings.
 - 2. Setting material, grouts, sealants and caulks.
 - 3. Installation of precast epoxy terrazzo stairs.
- C. Related Documents: The Conditions of the Contract and Division 1 apply to this Section as fully as if repeated herein.
- D. Related Sections:
 - 1. Section 05 51 13 – Metal Pan Stairs: Steel stairs to receive precast epoxy terrazzo.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C150 - Standard Specification for Portland Cement.
 - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 3. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 4. ASTM C-293 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 5. ASTM C-1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
- B. National Terrazzo and Mosaic Association Inc. (NTMA)
- C. Federal Register Part III:
 - 1. 28 CFR Part 36.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Color chart of manufacturer's standard color pallet.
- B. Shop Drawings:
 - 1. Submit shop drawings of all precast Epoxy terrazzo items showing detail sections and profile for all precast items. Details shall show all reinforcing and special hardware for fastening.

- C. Samples: Submit two 3" wide by full depth samples of each type of stair tread/riser unit to show the full range of color and texture of treads and integral detectable warning stripes, for selection and approval. If sealer is to be applied to stair tread surfaces, apply sealer on one sample.
 - 1. Color to be selected by Architect from manufacturer's standard color pallet.
 - 2. Submit two copies of NTMA maintenance literature.
 - 3. Quality Assurance and Procedure Program.
- E. Manufacturer's Installation Details: Submit complete.

1.4 INFORMATIONAL SUBMITTALS

- A. Certification:
 - 1. Suppliers shall furnish manufacturer's certification attesting that materials meet specification requirements.

1.5 QUALITY ASSURANCE

- A. NTMA Standards: Comply with specified provisions and recommendations of the National Terrazzo & Mosaic Association, Inc. (NTMA).
- B. Manufacturer's Instructions: In addition to specified requirements, comply with precast terrazzo manufacturer's instructions and recommendations for substrate preparation, materials storage, mixing and application, finishing and curing.
- C. Qualifications: Precast Terrazzo Manufacturer and Trade Contractor must have a minimum of 5 years of successful experience on projects of similar magnitude and complexity to that indicated project.
- D. Manufacturer to supply a written Quality Assurance Program and Procedure manual.
- E. Performance Requirements:
 - 1. Compressive Strength 4000 psi.
 - 2. Flexural Strength 600 psi.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging and Shipping: Precast terrazzo to be palletized and shrink wrapped, delivered in original unopened packaging with legible manufacturer identification, including size, piece number, quantities, manufacturer date and inspector initials.
- B. Storage and Protection: Precast terrazzo to be stored indoors, in a climate controlled environment, sheltered from moisture in original packaging. Protect from damage by other trades.
- C. Report all damage due to shipment immediately. Customer is required to sign the Bill of Lading slip noting damaged product. Picture proof is required.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the setting materials manufacturer for optimum results. Do not install

products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. Manufacturer/Installer shall warrant installed system for a period of 1 year from date of substantial completion against failure of workmanship and materials.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer:
Tectura Designs, 800-388-8728 Phone: (715) 359-3121 Fax: (715) 355-4627
E-mail: info@tecturadesigns.com Website: www.tecturadesigns.com
- B. Basis-of-Design Product: E-31 Tread & Riser (one-piece integral tread and riser).
- C. Clarification Note: Drawings and specifications are based on manufacturer's proprietary literature from Wausau Tile, Inc. Other manufacturers shall comply with minimum levels of material specifications and detailing indicated on the drawings of specified herein.
- D. Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.2 MATERIAL REQUIREMENTS

- A. Epoxy Resin.
- B. Aggregates: Aggregates to meet ASTM C-33 specifications, cleaned and properly graded to size. Aggregate shall be blended to meet individual project requirements.
- C. Marble chips: Size to conform with NTMA gradation standards.
- D. Abrasive Inserts: Shall consist of silica sand and black epoxy. Provide three lines of abrasive insert at each stair tread and top landing.
- E. Caulks and Sealants:
 - 1. Urethane or Polyurethane Sealant.
 - 2. Color to be selected by Architect from manufacturer's standard color pallet.
- F. Cleaner: Liquid neutral chemical cleaner, with pH factor between 7 and 8, of formulation recommended by sealer manufacturer for type of precast terrazzo used and complying with NTMA requirements.
- G. Sealer: Colorless, slip and stain-resistant penetrating sealer with pH factor between 7 and 8, that does not affect color or physical properties of precast terrazzo surface. Flash point (ASTM D56): 80 degrees F, Minimum.

2.3 MANUFACTURED UNITS

- A. Sizing Tolerances:
 - 1. All units to conform to shop drawings with a 1/16" tolerance in dimension.

- B. Precast Surfaces and Edges:
 - 1. Exposed edges to be ground and polished with a minimum of 1/16" bevel.
 - 2. Finished surfaces to be ground and polished, free of holes and to have overall uniformity in matrix and aggregate.
 - 3. Precast epoxy terrazzo finished surfaces to be sealed with a sealer approved by manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive precast terrazzo for the following:
 - 1. Defects in existing work.
 - 2. Deviations beyond allowable tolerances for the substrate.
- B. Start work only when all defects have been corrected by others.

3.2 INSTALLATION

- A. Setting:
 - 1. Setting methods will vary per product. Set accurately as shown on the approved shop drawings. Contact your setting material manufacturer with any questions on proper bonding of all materials.
- B. Setting Methods:
 - 1. Cement-based setting materials: Contact your selected manufacturer as recommended or specified. Setting materials can change without notice.
 - 2. Epoxy based setting materials: Contact your selected manufacturer as recommended or specified. Setting materials can change without notice.
 - 3. All thinset materials, whether cement or epoxy based, will require a full setting bed be applied to all appropriate surfaces of the precast terrazzo, vertical and horizontal, where contact is made with the substrate or structural base.
 - 4. Alignment of precast should be straight and true to all dimensions. It may not vary more than 1/8" in length, height or width.
 - 5. Fill joints between with manufacturer-approved caulk or as specified.
- C. Protection:
 - 1. Upon completion, the work shall be ready for final inspection and acceptance by Owner or Architect.
 - 2. General Contractor shall protect the finished work from the time the terrazzo contractor completes the work.
- D. Finish:
 - 1. Precast epoxy terrazzo finished surfaces to be sealed with a sealer approved by epoxy terrazzo manufacturer.

END OF SECTION

09/21/18

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 05 12 13 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
2. Section 05 31 00 "Steel Decking" for field installation of shear connectors through deck.
3. Section 05 50 00 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.
4. Section 09 91 00 "Painting" for painting requirements.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Force-Resisting System: Elements of structural-steel frame designated as "SFRS" or along grid lines designated as "SFRS" on Drawings, including columns, beams, and braces and their connections.
- C. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Force-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the structural steel only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Institute of Steel Construction (AISC)
American Society for Testing and Materials (ASTM International)
American Welding Society (AWS)
The Society for Protective Coatings (SSPC)
Research Council on Riveted and Bolted Joints (RCRBJ)

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

- A. Product Data:
 - 1. High-strength, bolt-nut-washer assemblies.
 - 2. Filler material for welding.
 - 3. Shear stud connectors.
 - 4. Anchor rods.
 - 5. Threaded rods.
 - 6. Shop primer.
 - 7. Galvanized-steel primer.
 - 8. Shrinkage-resistant grout.
- B. Shop Drawings: Submit shop and erection drawings for review. Review of drawings will cover only the general scheme, design, and character of the details, but not the checking of dimensions nor will such review relieve the Contractor from responsibility for executing the construction in accordance with the contract documents.
 - 1. Field Measurements: Before starting construction or proceeding with shop and erection drawings, verify measurements, lines, grades, elevations, locations and details of existing field conditions and be responsible for correctness, conformity, accuracy and execution of structural steel construction to conform to actual conditions.
 - 2. Detailing: Detail in conformance with the AISC Manual "Structural Steel Detailing", except where otherwise indicated.
 - 3. Field Connections: Clearly show field connections on the erection drawings with complete details as required so that the connections can be made without reference to the design drawings.
 - 4. Provide setting drawings, templates, and directions for installation of anchor bolt and other anchorages to be installed under other sections.
 - 5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 7. Identify members and connections of the Seismic-Force-Resisting System.
 - 8. Indicate locations and dimensions of protected zones.
 - 9. Identify demand-critical welds.
 - 10. Identify members not to be shop primed.

11. Dimensions and Locations: Obtain exact dimensions and locations of all proprietary or manufactured items and equipment (HVAC gear, skylights, hatches, etc.) that affect structural steel members. Coordinate all such data and incorporate into shop drawings.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Submit mill test certificates for mill order steel which can be identified readily by means of heat or melt numbers marked at the mill and for which continuity of such identification can be maintained at the place of fabrication to the satisfaction of the testing agency. Such steel need not be tested as specified in Section 01 45 00.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Tension-control, high-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify welding procedures and welding operators in accordance with AWS D1.1, "Structural Welding Code - Steel."

1. Provide certifications that welders to be employed have satisfactorily passed AWS qualification tests. If recertification of welders is required, retesting will be the Contractor's responsibility.

B. Regulatory Requirements:

1. Except as modified by the requirements indicated or specified herein, structural steel construction shall conform to the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 22A - Steel.
2. CalGreen Requirements: Coating and repair materials shall comply with environmental requirements of 2016 California Building Code (CBC) Title 24 Part 11.
 - a. The quantity of volatile organic compounds (VOC) used in materials shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.8 DELIVERY, STORAGE, AND HANDLING:

A. Deliver material in time to insure uninterrupted progress of the construction.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Use only new and undamaged materials. Steel that in the opinion of the Inspector is badly corroded or physically damaged shall not be incorporated in the construction.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Structural Steel W and WT Shapes: ASTM A992, Grade 50.
- B. Structural Steel, Angles, Channels, Miscellaneous Channels, Bars and Plates: ASTM A36.
- C. Cold-Formed Hollow Structural Sections: (HSS, Square and Round): ASTM A500, Grade B.
- D. Steel Pipe: ASTM A53, Type E or S, Grade B, with maximum sulfur content of 0.05 percent.
- E. Filler Metal for Welding: Meet the requirements of AWS D1.1.
- F. Welding Electrodes: Comply with AWS requirements. Welding electrodes shall be as recommended by their manufacturers for the position and other conditions of actual use. Electrodes shall be E70xx series.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High Strength Bolts: ASTM A325-N; ASTM A325-SC where indicated. Nuts: Heavy Hex, Grade C, conforming to ASTM 563.
- B. Common Machine Bolts and Anchor Bolts: ASTM A307, Grade A. Nuts shall conform to ASTM A563, Hex Grade A.
- C. Welded, Threaded Stud Anchors: ASTM A36.
- D. Anchor Bolts, Pins and Rods: ASTM F1554 (grade as indicated), ASTM A307, A36, or A283, Grade D.

2.4 PRIMER

- A. Exterior Architecturally Exposed Structural Steel: High-build epoxy-polyamide primer. Acceptable products or equal:
- Carboline Co.; No. 893
Rust-O-Leum Corp.; No. HS 9369
The Sherwin Williams Co.; No. B58-620/V620
Tnemec Co., Inc.; Epoxoline 66-1211
- B. Interior Architecturally Exposed Structural Steel and Concealed Structural Steel: Fast curing, lead and chromate free, modified alkyd primer. Acceptable products or equal:
- Carboline Co.; No. GP-20 or GP-818
Rust-O-Leum Corp.; No. 678 or 7669
The Sherwin Williams Co.; No. B66-310 Series
Tnemec Co., Inc.; 10-99 or P10-99
- C. Galvanizing Repair Compound: High zinc dust content galvanizing repair paint conforming to ASTM A780 or hot applied zinc rich material. Acceptable products or equal:
- American Solder & Flux; Drygalv
Kenco Div.; Galvicon
Metalloy Products Co.; Galvaloy

2.5 SHRINKAGE-RESISTANT GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time. For use in concealed locations. Acceptable products or equal:
- Gifford-Hill & Co., Inc.; Supreme Plus
Master Builders; Embeco 636
Sonneborn Building Products; Ferrolith G-DS
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. For use in exposed-to-view locations. Acceptable products or equal:
- Gifford Hill & Co., Inc.; Supreme
Master Builders; Masterflow 713
The Upco Company; Upcon Nonshrink

2.6 FABRICATION

- A. General: Fabricate and assemble materials in the shop to the greatest extent possible. Shearing, flame cutting, and chipping shall be done carefully and accurately. Coordinate connection details where steel attaches to concrete. Verify lines, levels, and dimensions, where possible, just before commencing fabrication of connection details. Correct construction that does not fit. Schedule and coordinate construction under this section with that specified elsewhere. When not otherwise indicated or specified, comply with applicable requirements of AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings".
- B. Exposed Steel Work: Where steel surfaces are exposed to view in the finished construction, use only materials that are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such

blemishes by grinding or by welding and grinding, before cleaning, treating and application of surface finishes.

- C. Connections: Bolt or weld connections as indicated. One sided or other types of eccentric connections will not be permitted unless shown in detail on the Contract Drawings. Where exposed, limit bolt projections beyond face of nuts to one-half inch.
 - 1. Make welded connections in accordance with AWS D1.1. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.
 - 2. Grind and dress smooth welds exposed to view in the finished construction, so that the shape and profile of the item welded is preserved.
- D. Joints: Compression joints depending upon contact bearing shall have bearing surfaces truly milled perpendicular to their axis. Cut or dress other joints straight and true.
- E. Holes: Cut, drill, or punch holes at right angles to the surface of the metal. Do not enlarge holes by burning, however holes may be enlarged by careful reaming. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connecting the construction of other trades.
- F. Marking: Mark members for erection in accordance with shop drawings. Members weighing over 4 tons shall have the weight so marked on the member. Long members shall be loaded onto the trucks and so marked.

2.7 GALVANIZING

- A. General: All steel and ferrous metal items located on the exterior of the building, and otherwise specifically indicated to be galvanized, shall be galvanized by the hot-dip process, meeting the requirements of ASTM A123. All required hot-dip galvanizing shall be done after fabrication, in the largest sections possible. Items too large for available dip tanks shall be sprayed, by approved methods, with molten zinc to coating thickness of 0.003-inch to 0.004-inch.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
- B. Coating Weight: Weight of the zinc coating per square foot of actual surface shall average not less than 2.0-ounces and no individual specimen shall show less than 1.8-ounces.
- C. Repair of Coating: Restore shop galvanized metal necessitating field soldering or welding which in any manner removes original galvanizing, by using galvanizing repair compound in accordance with the manufacturer's instructions.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.

- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Field Measurements and Templates: Secure field measurements required for proper and adequate fabrication and installation. Furnish templates not less than 14-gage, for each individual anchor bolt assembly with reference centerlines or working points clearly marked in order to locate all items to be embedded in concrete together with setting instructions required for installation.
- B. Temporary Shoring and Bracing: In accordance with CCR Title 8, design and provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are securely in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structure as erection proceeds. Design of such shoring and bracing is the Contractor's responsibility.
- C. Temporary Planking: Provide temporary planking as required by CCR Title 8 and as necessary to effectively complete the construction.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. After the supported members have been plumbed, aligned and properly positioned, set base and bearing plates.
 2. Support plates on adjustable bolt supports or shims until grout has set.
 3. Place non-shrink grout or drypack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
 4. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
- E. Framing: Except as specified herein, erect framing in accordance with the AISC Code of Standard Practice for Steel Buildings and Bridges, latest edition, and 2016 CBC Title 24 Part 2. Plan and lay out framing so that cutting will not be required. Erect the construction plumb, square, and true to line, level, and position within tolerances established in the AISC referenced codes.
- F. Holding and Protection: In assembling and during welding, hold the component parts with jogs, clamps or other adequate means to keep parts straight and in close contact. In welding, take precautions to minimize "lock-up" stress and distortion due to heat. During windy conditions in the field perform welding only after adequate wind protection is furnished and set up.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified. Provide high strength bolted connections for principle bolted connections where indicated.
1. Joint Type: Slip critical.
- B. Bolted Connections: Bolt field connections except where welding is indicated. Provide common bolted connections using a minimum of 5/8-inch diameter bolts for connections not indicated.
- C. Weld Connections: Comply with AWS D1.1/D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
- D. Camber: Inspect beams and girders in the shop for camber and align so that they are fabricated and erected with their camber turned upwards. Camber shall not exceed the requirements of the governing documents.

- E. On all structural steel construction, remove erection bolts, temporary welds, run-off plates and backing strips. Fill holes from erection bolts with plug welds and grind smooth.

3.5 FIELD INSPECTION AND TESTING

- A. Inspection and testing are specified in Section 01 45 00.
- B. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Refer to DSA 103 – Listing of Structural Tests and Special Inspections – 2016 CBC.

3.6 PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 00 "Painting."

3.7 AS ERECTED DRAWINGS

- A. After all steel has been erected, correct or revise the shop drawings and erection diagrams to correspond with the changes made in the field. Refer to requirements specified in Section 01 78 39 "Record Documents."

END OF SECTION

03/22/19

SECTION 05 12 13

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel (AESS). Refer to Section 05 12 00 "Structural Steel Framing" for all other requirements regarding steel work not included in this section.

This section applies to any members noted on Architectural and/or Structural drawings as AESS 1, and in the areas defined as AESS below.

1. The following structural steel elements and connections are to be supplied and erected per AESS 1: As indicated on Architectural and/or Structural drawings.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
1. Sections 05 31 00 "Steel Decking" for erection requirements relating to exposed steel decking and its connections.
 2. Section 05 50 00 "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
 3. Section 09 91 00 "Painting" for surface preparation and priming requirements.

1.2 DEFINITIONS

- A. Architecturally Exposed Structural Steel: Structural Steel conforming to one of the categories of Architecturally Exposed Structural Steel or AESS. Refer to ANSI/AISC 303-16 "Code of Standard Practice for Steel Buildings and Bridges."
- B. Category AESS 1: Structural Steel designated as "AESS 1" in the contract documents and conforming to ANSI/AISC 303-16, Chapter 10 definition of AESS1. These are basic elements with workmanship requirements exceeding those in non AESS construction.

1.3 COORDINATION

- A. Coordinate surface preparation requirements for shop-primed items.
- B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- C. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation. Anchorage concepts shall be as indicated on drawings and approved on final Fabrication Documents.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. The General Contractor shall schedule and conduct conference at the project site to comply with requirements of Division 1 Section "Project Meetings." As a minimum, the meeting shall include the General Contractor, Fabricator, Erector, the finish-painting subcontractor, IOR, and the Architect. Coordinate requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, final coating, touch up painting, mock up coordination, Architect's observations, and other requirements for AESS.

1.5 ACTION SUBMITTALS

- A. Product Data:
 - 1. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 2. Corrosion-resisting (weathering steel), tension-control, high-strength, bolt-nut-washer assemblies.
 - 3. Filler.
 - 4. Primer.
 - 5. Galvanized-steel primer.
 - 6. Etching cleaner.
 - 7. Galvanized repair paint.
- B. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS.
 - 1. Identify AESS category for each steel member and connection, including transitions between AESS categories and between AESS and non-AESS.
 - 2. Include details that clearly identify all the requirements listed in Article 2.5 "FABRICATION" and Article 3.3 "ERECTION" of this specification for each part. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.
 - 3. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 4. Include embedment Drawings.
 - 5. Indicate orientation of mill marks and HSS seams.
 - 6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
 - 7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation and location of bolt heads.
 - 8. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
 - 9. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.
 - 10. Indicate weep holes for HSS and vent holes for galvanized HSS.
 - 11. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.
- C. Samples For AESS 1: Provide samples of specific AESS characteristics. Samples may be small size samples or components of conventional structural steel demonstrating the following specific AESS characteristics.
 - 1. Continuous weld appearance.
 - 2. Sharp edges ground smooth.

3. Surface preparation.
4. Fabrication mark removal.
5. Weld show through.
6. Example Fabrication Samples:
 - a. Two steel plates, 3/8 by 8 by 4 inches, with long edges joined by a groove weld, and with weld ground smooth.
 - b. Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.
 - c. Round steel tube or pipe, minimum 8 inches in diameter, with end of another round steel tube or pipe, approximately 4 inches in diameter, welded to its side at a 45-degree angle with a continuous fillet weld and with weld ground smooth and blended.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification data for firms and persons specified in the 'Quality Assurance' Submittal to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, and other information specified.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: In addition to those qualifications listed in Section 05 12 00 "Structural Steel Framing," engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.
- B. Erector Qualifications: In addition to those qualifications listed in Division 5 Section "Structural Steel Framing", engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation. All tie downs on loads shall be nylon straps or shall use softeners when using chains or wire rope slings to avoid damage to edges and surfaces of members. The standard for acceptance of delivered and erected members shall be equivalent to the standard employed at fabrication.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.
- C. Handle finish pieces using nylon type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged. Conform to ANSI/AISC 303-16 Sections 10.4, 10.5, and 10.6.

1.9 FIELD CONDITIONS

- A. Field Measurements: Where AECS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Fabrication Documents. Coordinate fabrication schedule with construction progress to avoid delaying the work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of ANSI/AISC 303, Sections 1 through 9 and as modified in Section 10, "Architecturally Exposed Structural Steel."

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

- 1. Finish: Plain.

2.3 FILLER

- A. Polyester filler intended for use in repairing dents in automobile bodies.

2.4 PAINT SYSTEM

- A. Compatibility: All components/procedures of the AECS paint system shall conform to the coating system specified, submitted, and approved per Section 09 91 00 "Painting." As a minimum, identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating and finish coating shall be from a single manufacturer combined in a system documented by the manufacturer with adequate guidance for the fabricator to procure and execute.
- B. Steel Primer: Comply with Section 09 91 00 "Painting."
- C. Finish Coating: Field apply intermediate and top coats per Section 09 91 00 "Painting."

2.5 FABRICATION

- A. Shop fabricate and assemble AECS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
 - 1. Use special care handling and fabricating AECS before and after shop painting to minimize damage to shop finish. Use Nylon type slings or softeners when using chains or wire rope slings.

2.6 FABRICATION - CATEGORY AECS 1

- A. The permissible tolerances for member depth, width, out of square, and camber and sweep shall be as specified in the following:
 - 1. ASTM A6/A6M-2014 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling;
 - 2. ASTM A500/A500M-2013 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; and
 - 3. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Structural Sections (HSS).
- B. Fabricate and assemble AECS in the shop to the greatest extent possible. Locate field joints in AECS assemblies at concealed locations or as approved by the Architect. Detail AECS assemblies to minimize field handling and expedite erection.
- C. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
- D. Remove all backing and run out tabs.
- E. Grind all sharp edges smooth, including all sheared, punched or flame cut edges
- F. Provide a continuous appearance to all welded joints including tack welds. Provide joint filler at intermittent welds.
- G. Bolted Connections: Make in accordance with Section 05 12 00. Provide bolt type and finish as noted herein.
- H. Weld Connections: Comply with AWS D1.1 and Section 05 12 00. Appearance and quality of welds shall be consistent. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this section.
- I. Install all bolts on the same side of the connection. Oriented uniformly in the direction indicated Consistent from one connection to another.
- J. Remove all weld spatter, slivers and similar surface discontinuities.
- K. Grind off projections larger than 1/16" at butt and plug welds.
- L. Continuous Weld Appearance: Where continuous welding is noted on the drawings, provide welds of a uniform size and profile
- M. Seal Welds: Seal weld open ends of round and rectangular hollow structural section with 3/8" closure plates. Provide venting as required for galvanized members.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Slip critical.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M (for high-seismic applications) for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

- A. Provide surface preparations to SSPC-SP6. Coordinate the required surface profile with the approved paint submittal prior to beginning surface preparation. Prior to blasting remove any grease and oil using solvent cleaning to meet SSPC-SP 1. Weld spatter, slivers and similar surface discontinuities shall be removed. Sharp corners resulting from shearing, flame cutting or grinding shall be eased.
- B. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
- C. Surface Preparation: Clean nongalvanized surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards: **TBD.**
 - 1. SSPC SP 1 – SSPC Surface Preparation Specification 1, Solvent Cleaning.
 - 2. SSPC SP 2 – SSPC Surface Preparation Specification 2, Hand Tool Cleaning. (This level of surface preparation may not be adequate for various paint systems for AESS construction).
 - 3. SSPC-SP 3 – SSPC Surface Preparation Specification 3, Power Tool Cleaning. (This level of surface preparation is the minimum for most AESS projects. It may be acceptable for alkyd primers and acrylic or alkyd finish coats, particularly in interior applications.).
 - 4. SSPC-SP 6 (WAB)/NACE WAB-3. SSPC SP 6 – SSPC Surface Preparation Specification No. 6, Commercial Blast Cleaning. (This level of surface preparation adds significantly to the cost. It is required for epoxy primers for adequate bonding to the steel and recommended for locations where a rust inhibitive primer will be used in an exterior application. It is also required where polyurethane finish coats will be used over the primer.)
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and eased edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.9 FABRICATION QUALITY CONTROL AND QUALITY ASSURANCE AESS 1

- A. Structural requirements:
 - 1. Conform to Quality Control requirements per ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges", Section 10. Refer to Section 05 12 00 "Structural Steel" for additional requirements.
 - 2. Owner will engage a Quality Assurance agency per the requirements of ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges", Section 10
- B. AESS acceptance: The Architect shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the qualifi-

cation data and submittals. The Quality Assurance agency shall have no responsibility for enforcing the requirements of this section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments, showing dimensions, locations, angles, and elevations.
- B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide connections for temporary shoring, bracing and supports only where noted on the approved Fabrication Documents. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect.
- B. Handle, lift and align pieces using nylon straps or chains with softeners required to maintain the appearance of the AESS through the process of erection.
- C. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION AESS 1

- A. Employ special care to handle and erect AESS. Erect finish pieces using nylon straps or chains with softeners such that they are not damaged.
- B. Place weld tabs for temporary bracing and safety cabling at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection.
- C. AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per Chapter 7 of ANSI/AISC 303-16.
- D. Set AESS accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- E. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
- F. Remove all backing and run out tabs.
- G. When temporary braces or fixtures are required to facilitate erection, care shall be taken to avoid any blemishes, holes or unsightly surfaces resulting from the use or removal of such temporary elements.

- H. Bolted Connections: Align bolt heads on the same side of the connection as indicated on the approved fabrication or erection documents.
- I. Weld Connections: Comply with AWS D1.1 and Section 05 12 00. Appearance and quality of welds shall be consistent. Employ methods that will maintain alignment of members without warp exceeding the tolerance of this section.
- J. Remove all weld spatter exposed to view.
- K. Grind off projections larger than 1/16" at field butt and plug welds.
- L. Continuous Welds: Where continuous welding is noted on the drawings, provide continuous welds of a uniform size and profile.
- M. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.
- N. Splice members only where indicated.
- O. Obtain permission for any torch cutting or field fabrication from the Architect. Finish sections thermally cut during erection to a surface appearance consistent with the mock up.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Slip critical.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M (for high-seismic applications) for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect AECS as specified in Section 05 12 00 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.
- B. AECS 1: Architect shall observe the AECS steel in place and determine acceptability based on the qualification data and submittals. The Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

3.6 PROTECTION

- A. Touchup Painting:
 - 1. Cleaning and touchup painting are specified in Section 09 91 00 "Painting."

END OF SECTION

03/22/19

SECTION 05 31 00

STEEL DECKING

PART 3 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Acoustical roof deck
3. Composite floor deck.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors and supplementary framing.
3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Section 07 52 00 "Modified Bituminous Membrane Roofing" for installation of absorbing elements and spacers for acoustical roof deck.
5. Section 09 91 00 "Interior Painting" for field painting.

C. Products Furnished But Not Installed Under This Section:

1. Sound absorbing elements and spacers for acoustical roof deck are furnished under Section 05 31 00, for installation by Section 07 52 00.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the stone facing only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Institute of Steel Construction (AISC)
American Society for Testing and Materials (ASTM International)
American Welding Society (AWS)
Steel Deck Institute (SDI)
Underwriters Laboratories, Inc. (UL)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Product data for Acoustical Roof Deck and hanging devices including material types, dimensions, section properties, load tables, diaphragm shear tables, dimensions, finishes, and noise reduction coefficients.

C. Shop Drawings: Submit shop, erection and placement drawings of floor and roof deck and shear studs. Include deck layout, framing and support of openings, dimensions and sections, details of accessories and type and location of welds.

1. Field Measurements: Before starting shop and erection drawings, verify measurements, lines, grades, elevations, locations and details of field conditions and be responsible for correctness, conformance, accuracy and execution of construction to conform to actual conditions.
 2. Detail the construction in conformance with the AISC Structural Steel Detailing Manual, except where otherwise indicated.
 3. Field Connections and Placement Diagrams: Show field connection and placement diagrams on the erection drawings with complete details, layouts and dimensions.
 4. Changes: Minor, non-structural changes from the design drawings may be shown on the shop and erection drawings provided they are clearly indicated as such. Structural changes must have prior approval from the Architect and Division of the State Architect (DSA) Structural Safety Section (SSS).
- D. Insurance Certification: Assist the Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 1. Power-actuated mechanical fasteners.
 2. Acoustical roof deck.
- D. Evaluation Reports: For steel deck, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify welding procedures and welding operators in accordance with AWS D1.3 "Structural Welding Code – Sheet Steel". Provide certifications that welders to be employed in the construction have satisfactorily passed AWS qualification tests for light gage welding. If recertification of welders is required, retesting will be the Contractor's responsibility.
- B. Welding: Shall comply with applicable provisions of American Welding Society (AWS) D1.1 "Structural Welding Code – Steel," and D1.3 Structural Welding Code - Sheet Steel."
- C. Superimposed load and diaphragm shear capacities shall be computed in accordance with the requirements of the Steel Deck Institute (SDI).
- D. Regulatory Requirements: Furnish and install metal deck in accordance with the manufacturer's current ICC-ES Evaluation Report and UL listing requirements to obtain diaphragm values and fire ratings indicated.
- F. Manufacturer Qualifications: Acoustical Roof Deck manufacturer shall have been regularly engaged in the production of an acoustical roof deck section with dovetail-shaped ribs for a period of at least 10 years.

- G. Noise Reduction Coefficients for Acoustical Roof Deck: Shall be verified by the results of sound absorption tests conducted in accordance with ASTM C423 and E795. A minimum NRC of 0.95 shall be provided. Copies of the sound absorption test shall be submitted upon request. See paragraph 2.8.B.
- H. Acoustical Roof Deck shall have been tested and approved by Factory Mutual Research Corporation for use in Class 1 insulated steel deck roof construction. Acoustical Roof Deck shall be listed in the *FM Approval Guide*. All panels shall bear the appropriate FM approved label.
- I. Acoustical Roof Deck shall be approved by the International Code Council Evaluation Service (ICC-ES) for use as a structural roof deck and shear diaphragm and have a valid ICC-ES evaluation report.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck and maintain acoustical insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ASC Profiles, Inc., www.ascsd.com; DGB-36 Roof Deck.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), or ASTM A1063, Structural Steel (SS); Grade 50, G60 zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: 1-1/2 inches.
 - 4. Panel Width: 36 inches.
 - 5. Design Uncoated-Steel Thickness: 0.0474 inch (18 gauge).
 - 6. Span Condition: Double span, minimum.

7. Side Laps: DeltaGrip® Interlocking seam.

2.3 ACOUSTICAL ROOF DECK

- A. Basis-of-Design Product: Subject to compliance with requirements provide Epic Metals Corporation; www.epicmetals.com; Epicore ER2RA Acoustical Roof Deck.
- B. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40.
 2. Before forming, the steel coils shall have received a hot-dip protective coating of zinc conforming to ASTM A924, Class G60, as defined in ASTM A653.
 3. The minimum uncoated thickness of the steel furnished shall not be less than 95% of the design thickness.
 4. Deck Profile: As indicated.
 5. Profile Depth: 2 inches deep x 24 inches wide.
 6. Design Uncoated-Steel Thickness: 0.0474 inch (18 gauge).
 7. Span Condition: Double span minimum, typical unless otherwise noted.
 8. Side Laps: Full depth positive registering sidelaps than can be fastened by welds or screws.
 9. Sound-Absorbing Insulation: Manufacturer's standard premolded strip of glass or mineral fiber.
 - a. Installation of sound-absorbing insulation is specified in Section 07 52 00.
 10. Acoustical Performance: NRC 0.95 minimum, tested according to ASTM C 423.
- C. The acoustical roof deck shall serve as a structural roof deck and a finished ceiling as indicated on the contract drawings.
- D. The acoustical roof deck shall provide an exposed bottom surface that is substantially flat. The narrow rib openings of the acoustical roof deck shall provide the appearance of a linear ceiling. Fasteners for sidelaps and overlying roofing materials shall be concealed within the depth of the dovetail shaped ribs.
- E. Wedge Nut hanging devices that are specially configured to fit into the dovetail shaped ribs of the acoustical roof deck shall be available. These hanging devices shall be utilized whenever any related work is suspended from the acoustical roof deck. Wedge Nut hanging devices shall be furnished by the installer of the related work unless otherwise indicated, and shall have an ICC report, ESR 2255.

2.4 COMPOSITE FLOOR DECK

- A. Basis-of-Design Product: Subject to compliance with requirements provide ASC Profiles, Inc.; www.ascsd.com; 2WH-36 Floor Deck.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40, G60 zinc coating.
 2. Profile Depth: 2-1/8 inches.

3. Design Uncoated-Steel Thickness: 0.0474 inch (18 gauge).
4. Span Condition: Double span minimum, typical unless otherwise noted.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch (20 gauge) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated, or as recommended by SDI Publication No. 31 for overhang and slab depth.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Galvanizing Repair Paint: High zinc dust content galvanizing repair paint meeting the requirements of Mil. Spec DOD-P-21035A or hot applied zinc rich material. Acceptable products or equal:

American Solder & Flux; Drygalv
Kenco Div.; Galvicon
Metalloy Products Co.; Galvaloy
- H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

2.6 ACCESSORIES FOR ACOUSTICAL ROOF DECK

- A. Hanging Devices: Wedge Nut hanging devices shall be installable and relocatable along the length of the interior ribs of the acoustical roof deck. The manufacturer's product data shall be consulted for minimum spacing, load capacities, and proper installation procedure of the Wedge Nut hanging devices.
- B. Provide manufacturer's standard ridge plates, valley plates, transition plates, and closures as indicated on the structural drawings.
- C. Provide openings and reinforcement for openings noted specifically by the deck manufacturer on the structural drawings.
- D. Acoustical Elements: Provide acoustic elements for installation above the perforations in the bottom flat area between the dovetail shaped ribs. To facilitate field painting of the perforated surfaces, the sound absorbing elements shall be supported above the surface by spacers. Sound absorbing elements and spacers shall be furnished under this specification section for installation under Section 07 52 00.

2.7 MATERIALS

- A. Steel for Accessories: ASTM A653, Grade C, coating designation G-60.
- B. Small Rolled Steel Shapes and Bars Used for Reinforcing Openings and Holes: ASTM A36.
- C. Welding Electrodes: Comply with AWS requirements, E70XX, Low Hydrogen.
- D. Fasteners: Hex head, stainless steel, self-drilling #14 or larger, with molded washer to create water tight and permanent seal.
- E. Shear Studs: Headed stud type of cold finished carbon steel meeting the requirements of ASTM A108, Grade 1015 or 1020, with dimensions meeting the requirements of AWS D1.1-2010 and intended for use in composite construction. Use ferrules suitable for use with galvanized metal deck where required. Acceptable products or equal:

TRW/Nelson Stud Welding Division; Type S3L
 Erie & Jones Company; Erico Shear Connector Studs
- F. Paint: Manufacturer's baked-on, rust-inhibitive paint, for application to metal surfaces that have been chemically cleaned and phosphate treated.
- G. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.
- H. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
- I. Concrete Topping: As indicated and as specified in Section 03 30 00.

2.8 FABRICATION

- A. Roof Deck:
 - 1. Manufacture deck units to lengths as indicated on shop drawings.
 - 2. Panel end conditions are to be butted or end-lapped, 2" minimum.
 - 3. Sidelaps are to be male/female interlocking type allowing connection with DeltaGrip® tool.
 - 4. Sidelaps are to be nestable or interlocking when using screw-type fasteners.
- B. Acoustical Roof Deck:
 - 1. Acoustical roof deck shall have continuous dovetail shaped ribs.
 - 2. Acoustical roof deck shall have full depth positive registering sidelaps that can be fastened by welds or screws.
 - 3. Acoustical roof deck shall be fabricated with perforations. The perforated areas shall be located in the bottom flat areas between the dovetail shaped ribs. A minimum NRC value of 0.95 shall be provided. This value shall be established by sound absorption tests without the use of fiberglass insulation above the panels.
 - 4. The top and bottom surfaces of the acoustical roof deck shall be prime painted with Epic's standard white. Before painting, the galvanized steel shall be chemically cleaned and coated with an acid wash pretreatment primer followed by a coat of the manufacturer's standard prime paint and then oven baked. Compatibility of field applied finish paint with factory applied prime paint shall be the responsibility of the painting contractor.
- C. Composite Floor Deck:
 - 1. Manufacture deck units to lengths as indicated on shop drawings. Panel end conditions are to be butted. Sidelaps are to be male/female interlocking type, suitable for button punching.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- J. Where large predetermined openings for elevators, stairs, ducts and similar elements pass through panel units, furnish prefabricated units to fit job conditions. Where other holes or openings are required in decking after erection, reinforce such holes as indicated or required. Cantilever deck to the edge of construction as indicated.
- K. Provide proper bearing on supporting beams as indicated. Fasten steel panels to supporting beams by electric arc welding by certified welding operators. Weld or button punch seams as indicated. Provide all welding and screw attachments as indicated.
- L. Provide closures, end plates, profile plates and other accessories required for a complete installation. Weld in place.

3.3 ROOF-DECK INSTALLATION

- A. General: Install the metal deck and accessories in compliance with the manufacturer's written recommendations and approved shop drawings.

- B. Placing Metal Deck Units: Place metal deck units on supporting members and adjust to proper position. Ensure proper bearing on supporting members and accurate alignment of endlaps and sidelaps prior to permanently attaching units.
- C. Attachment of Metal Deck Units to Supports:
 - 1. Welded attachment of metal deck units to the supporting members shall conform to AWS D1.1 and D1.3. Welders shall be certified prior to commencing work. Attach metal deck units to supporting members with 3/4" effective diameter puddle welds.
 - 2. Weld Spacing: Space and locate welds as indicated.
- D. Connecting Sidelaps: Use ASC Steel Deck DeltaGrip® tool to create interlocking connection at spacing designated on the shop/erection drawings.
- E. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.
- F. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld.
- G. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- H. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 ACOUSTICAL ROOF DECK INSTALLATION

- A. General: Install acoustical roof deck in strict accordance with the manufacturer's instructions, approved erection drawings, and all applicable safety regulations.
- B. Locate bundles of Acoustical Roof Deck System components on supporting frame in such a manner that overloading of any individual members does not occur.
- C. Before being permanently fastened, place acoustical roof deck on the supporting frame and adjust to final position with ends accurately aligned and adequately bearing on the supporting frame. Maintain consistent coverage so that panels located in adjacent bays will be properly aligned.
- D. Perform field cutting of the Acoustical Roof Deck panels in a neat and precise manner. Cut only those openings shown on the structural drawings. Other openings shall be approved by the structural engineer and cut by those requiring the opening.
- E. Fasten Acoustical Roof Deck panels to all supporting members with 3/4" diameter puddle welds at a nominal spacing of 12" on center or less as indicated on the structural drawings.

1. Fasten sides of acoustical roof deck located at the perimeter of the building to supporting members with 3/4" diameter puddle welds at a maximum spacing of 36" on center or less as indicated on the structural drawings.
- F. Fasten sidelaps of acoustical roof deck together with top seam welds at 18" on center as indicated on the structural drawings.
 - G. Do not apply construction loads to acoustical roof deck until after the panels are permanently fastened to supporting members, and sidelaps are attached. The construction loads shall not exceed the capacity of the panels.
 - H. Do not suspend items such as ceilings, light fixtures, conduit, pipe and ductwork from acoustical roof deck without specific approval of the Structural Engineer.
 - I. Fasten sump pans, ridge plates, valley plates, transition plates, eave plates, and supplied reinforcement for small openings as indicated on the manufacturer's erection drawings.
 - J. Sound-Absorbing Insulation: Coordinate with Section 07 52 00 for installation of continuous strips of sound-absorbing insulation into topside ribs of acoustical deck. Installation is by Section 07 52 00.

3.5 FLOOR DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 1. Weld Diameter: 3/4 inch, nominal.
 2. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 24 inches, and as follows:
 1. Mechanically button punch.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:
 1. End Joints: Butted.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.
- F. Installation of Shear Studs:
 1. Only certified operators approved by the manufacturer shall install the studs and who are thoroughly familiar with the installation equipment. A copy of the operating instruction for the equipment shall be at the job site at all times.
 2. Installation and qualification of weld base shall meet the requirements of AWS D1.1-2010 except as specified herein. Refer Section 01 45 00 for inspection requirements.

3. Studs bent more than 15 degrees from the vertical by inspection and testing procedures shall be bent back to an acceptable angle and show no signs of failure if they are to be considered as part of the required studs. Otherwise they shall be replaced by additional studs.
 4. Studs that show no signs of failure will be accepted as shear connectors provided they meet the dimensional limitations indicated, provided no portion is less than one inch from a proposed concrete surface and provided bends or out of plumbness does not exceed 15 degrees. In addition, studs shall have a height of 4-1/2 inches after welding to provide a concrete cover of 1-inch minimum.
 5. The studs shall have complete fusion to the steel beams underlying the decking. Where repairs are made by fillet welding, such welding shall be between stud and beam with removal of portions of the decking as required.
 6. Where the decking is thick due to heavy gage sheets or double sheets at cellular panels, holes in one or more sheets shall be made before stud welding when required to ensure fusion of studs to beams. When such holes are not made, fusion shall be verified.
 7. Ferrules shall be removed after completion.
- G. Substitution of Puddle Welds by Shear Studs: When shear studs are installed through the metal deck without being installed through holes in single sheet units or holes through both sheets of cellular units, required puddle welds may be considered as being supplied by the studs on a one-to-one basis.
- H. Support at Columns: Where, due to cutting of deck units at columns, bearing support is not provided for the end of a web, such web shall be welded to the column or structural steel material at the column or equivalent support shall be provided. The welding or equivalent support shall be sufficient for the support of the deck, the "wet" weight of concrete and other construction loads.
- I. Touch Up of Welds: Upon cooling, touch-up all welds not to be encased in concrete topping with galvanizing repair compound.

3.6 AFTER INSTALLATION – ACOUSTICAL ROOF DECK

- A. Avoid construction loads that could damage the Acoustical Roof Deck such as heavy concentrated loads and impact loads. Use planking in all high traffic areas.
- B. Prior to the placement of the sound absorbing elements, clean the top surface of the Acoustical Roof Deck of all debris, grease, oil, and other foreign substances. Cleaning the bottom surface of the Acoustical Roof Deck for field painting shall be the responsibility of the contractor.
- C. Field repair galvanized coatings that are significantly damaged. Use appropriate galvanized repair paint, following the paint manufacturer's application instructions.
- D. Sound absorbing elements shall be dry before installation of the elements or overlying roofing insulation and roofing materials.

3.7 AS ERECTED DRAWINGS

- A. After all steel has been erected, correct or revise the shop drawings erection and placement diagrams to correspond with the changes made in the field. Refer to requirements specified in Section 01 78 39.

3.8 FIELD QUALITY CONTROL

- A. Field testing and inspection are specified in Section 01 45 00.
- B. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- C. Remove and replace work that does not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.9 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

END OF SECTION

09/21/18

SECTION 05 40 00

COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cold Formed metal framing systems as follows:
 - 1. Exterior non-load bearing wall framing.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes, and connections used with cold-formed metal framing.
 - 2. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
 - 3. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies and furring systems for gypsum board ceilings and soffits.
 - 4. Section 09 51 13 "Acoustical Panel Ceilings" for suspension systems for acoustical ceilings.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the stone facing only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Welding Society (AWS)
American Iron and Steel Institute (AISI)
ASTM International (ASTM)
Steel Stud Manufacturers Association (SSMA)

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Before beginning installation of the metal framing systems, hold a conference with representatives of the installers of metal framing systems, door frames, cement plaster, gypsum board, mechanical and electrical construction, Contractor, Owner's representative, and Architect in attendance. The conference shall assure a clear understanding of the drawings and specifications, resolve possible conflicts and establish coordination between all parties involved.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit framing manufacturer's literature, including a current ICC Evaluation Report, showing tabulation of structural properties, load capacities, dimensions, metal gages and type of coating for all framing and furring members.
- B. Shop Drawings:
 - 1. Submit shop drawings for wall and partition framing systems and special assemblies where the design is not indicated.
 - 2. Show layout, size, gage and cross sections and spacing of framing members; connections including welding procedures and electrodes; and supplemental strapping, bridging, lateral bracing, accessories, and details required for proper installation.
 - 3. Furnish layout of required clips or slots to the metal deck installer well in advance of deck installation.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding Certificates.
- B. Evaluation Reports: For cold-formed steel framing, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
 - 1. Metal stud manufacturer to have a 3rd party evaluation report for its products that are reviewed to the local building code or its model code (IBC 2015 and AISI NASPEC 2007) with 2016 amendments.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Regulatory Requirements: Furnish and install wall framing and powder driven fasteners in accordance with the framing and fastener manufacturer's current ICC Evaluation Reports.
- D. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.
- E. Fire Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 9 - California Fire Code, provide units which are listed in the current UL "Fire Resistance Directory" and that have been approved by the State Fire Marshal.
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

G. AISI Specifications and Standards: Comply with:

1. AISI S100 "North American Specification for the Design of Cold-Formed Steel Structural Members".
2. AISI S200 "North American Standard for Cold-Formed Steel Framing – General Provisions".
3. AISI S201 "North American Standard for Cold-Formed Steel Framing – Product Standard".
4. AISI S211 "North American Standard for Cold-Formed Steel Framing – Wall Stud Design".
5. AISI S212 "North American Standard for Cold-Formed Steel Framing – Header Design".
6. AISI S213 "North American Standard for Cold-Formed Steel Framing – Lateral Design".
7. AISI "Code of Standard Practice for Cold-Formed Steel Structural Framing".

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the project site and store them in adequately ventilated dry locations. If it is necessary to store materials outside, stack them off the ground on a platform and fully protected from the weather.
- B. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following:
 1. SCAFCO Steel Stud Company; www.scafco.com; ICC-ESR-3064P; (Basis-of-Design).
 2. ClarkDietrich Building Systems; www.clarkdietrich.com; ICC-ESR-1166P and ESR-2457.
 3. CEMCO Steel Framing Systems; ICC-ES Evaluation Report ESR-3403P.
 4. The Steel Network, Inc.; ICC-ES Evaluation Report ESR-1903 and ESR-2049.
 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Hot-dip Zinc Coated Steel: ASTM A653 Structural Grade or ASTM A1003, Structural Grade, of grade and coating designation as follows:
 1. Grade; 50,000 psi yield strength for 16-gage and greater; and 33,000-psi yield strength for 18-gage and lighter.
 2. Coating: Hot-dip zinc coating complying with designation G60.
- C. Steel Sheet for Vertical Deflection/Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1.
2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: As indicated.
 2. Flange Width: As indicated.
 3. Section Properties: As indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: Matching steel studs, or as indicated.
 2. Flange Width: As indicated.
- C. Vertical Deflection/Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure, having a valid ICC ES Report complying with ICC Acceptance Criteria AC261, such as ICC-ESR-2049 or equivalent. Mechanical attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement; 68 mils (1.72 mm) minimum thickness, size as required by structural design calculations.
 1. Basis-of-Design Product: The Steel Network, Inc. DriftClip including step bushings.
 - a. By-pass Structure: The Steel Network, Inc. DriftClip (DSLs).
 2. Or equal.
- D. Single Deflection/Drift Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement and lateral building drift, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 1. Basis-of-Design Product: The Steel Network, Inc. DriftTrak including step bushings.
 - a. Exterior Head of Wall Free Lateral Movement Assembly: The Steel Network, Inc. DriftTrak (DTSL).
 2. Or equal.

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.

- 10. Hole reinforcing plates.
- 11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.
- B. Anchor Bolts: ASTM F1554, Grade indicated, threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

Hilti Corp.; Kwik Bolt-TZ; ICC Report ESR-1917

- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

Hilti Corp.; ICC Report ESR-2269
ITW/Ramset/Red Head; ICC Report ESR -1147

- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS requirements. ASTM electrode classification A233 E60.
- G. Screws: Minimum No. 10 by 3/8-inch cadmium or zinc coated TEKS screws with pan heads.
- H. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper.
- I. Concrete inserts, expansion anchors, powder driven fasteners, flange clips, and bolts for attachment of hanger wires to overhead construction shall have a rated capacity equal to that of the hanger wire.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20. High zinc dust content galvanizing repair paint meeting the requirements of ASTM A780 or hot applied zinc rich material. Acceptable products or equal:

American Solder & Flux; Drygalv
Kenco Div.; Galvicon
Metalloy Products Co.; Galvalloy

- B. Cement Grout: Portland cement, ASTM C150, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.
- D. Backing Plates: Steel, 3/16 inch thick, of proper size to accommodate fastenings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. General: Conform to rules and practices set forth in the 2016 CBC Title 24 Part 2 and AISI "Specifications for Design for Cold Formed Steel Structural Members," and with the manufacturer's printed instructions and recommendations, as applicable.
- B. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- C. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- D. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- E. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- F. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- G. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- H. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- I. Install insulation, specified in Section 07 21 00, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- J. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

- K. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches, unless otherwise indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deflection/drift tracks and anchor to building structure.
 - 2. Connect vertical deflection/drift clips to infill studs and anchor to building structure, where shown on drawings.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection/Drift Track: Install row of horizontal bridging within 12 inches of single deflection/drift track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated on drawings.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

- B. Touch up abrasions, burns, and welding, including construction activities of other trades, with primers for primed steel or with approved galvanizing compound if galvanized. Remove oil, grease, rust, loose scale, loose coatings, weld slag and other deleterious material before touch-up.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

03/22/19

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Work includes, but is not limited to, the following:
1. Steel framing and supports for operable partitions.
 2. Steel framing and supports for overhead doors and grilles.
 3. Steel framing and supports for countertops.
 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 5. Elevator hoist beams.
 6. Steel shapes for supporting elevator door sills.
 7. Metal ladders.
 8. Metal bollards.
 9. Steel pipe downspouts.
 10. Cane detection rails.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Products furnished, but not installed, under this Section include the following:
1. Loose steel lintels.
 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- D. Related Requirements:
1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 2. Section 05 12 00 "Structural Steel Framing."
 3. Section 05 51 33 "Metal Ladders" for aluminum roof access ladders.
 4. Section 05 52 13 "Pipe and Tube Railings" for pipe and tube railings.
 5. Section 08 92 00 "Louvered Equipment Screens" for roof top mechanical equipment screens.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
American Institute of Steel Construction (AISC)
ASTM International (ASTM)
American Welding Society (AWS)
National Association of Architectural Metal Manufacturer's (NAAMM)

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings:
 - 1. Submit shop drawings of miscellaneous metal work giving sizes, details of fabrication and construction, methods of assembly and bracing, and locations of hardware, anchors, and accessories.
 - 2. Include shop and erection details, including cuts, copes, connections, holes, bolts and welds. Indicate welds, both shop and field, by standard welding symbols in AWS D1.1. Show the size, length and type of each weld. All materials to be brazed or soldered shall have connections indicated by symbols that are industry standards.
 - 3. Contractor shall be responsible for all fabrication and for correct fitting of metal members shown on shop drawings.
 - 4. Provide Shop Drawings for the following:
 - a. Steel framing and supports for operable partitions.
 - b. Steel framing and supports for overhead doors and grilles.
 - c. Steel framing and supports for countertops.
 - d. Elevator machine hoist beams.
 - e. Metal ladders.
 - f. Metal bollards.
 - g. Steel pipe downspouts.
 - h. Steel cane detection rails.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- C. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
- B. Regulatory Requirements: Provide products meeting the accessibility requirements of the 2016 California Building Code (CBC) Title 24 Part 2 Chapter 11B - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Publicly Funded Housing; and 2010 ADA Standards for Accessible Design.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver material in time to ensure uninterrupted progress of the work.
- B. Store materials in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Store steel materials, either plain or fabricated, above the ground upon platforms, pallets, skids, or other supports.
- C. Keep materials free from dirt, grease, and other foreign matter, and protect from corrosion. Material showing evidence of damage will be rejected; immediately remove rejected materials from the work.

1.8 FIELD MEASUREMENTS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- F. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- G. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- H. Pipe Sleeves: Pipe sleeves through concrete walls and footings shall be standard weight, wrought iron, mild steel, or cast iron sleeves with not less than 1/2-inch space all around between the sleeve and pipe.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1 for Type 304 stainless steel, and Group 2 for Type 316L stainless steel.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593), and nuts, ASTM F 594.

2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Primer:
 - 1. Steel Surfaces: Fast curing, lead and chromate free, modified alkyd primer. Acceptable products or equal:

Carboline Co.; No. GP-20 or GP-818
Rust-O-Leum Corp.; No. 678 or 7669
The Sherwin Williams Co.; No. B50 N 2 or B50N Z 6
Tnemec Co., Inc.; 10-99 or P10-99

- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Quick Setting Hydraulic Cement: Acceptable products or equal:
 - The Burke Co.; Burke Plug
 - Minwax Construction Products Div.; Super Por-Rok
 - Tamms Industries Co.; Tammstech Rapid Rock
 - Master Builders; Masterflow 713
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- H. Nonshrink, Nonmetallic, Grout: For grout in exposed to view locations use premixed, nonmetallic, non-corrosive, non-staining grouting compound containing silica sands, portland cement, shrinkage compensating agents and water reducing agents, meeting the requirements of ASTM C1107. Acceptable products or equal:
 - Gifford Hill & Co., Inc.; Supreme
 - Master Builders; Masterflow 713
 - The Upco Company; Upcon Nonshrink
- I. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated or as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.6 COUNTERTOP SUPPORTS

- A. Fabricate countertop supports of welded steel angles of sizes and shapes indicated. Grind exposed welds smooth. Provide complete with attachments to framing and counters. Countertops are specified in Section 06 41 16.

2.7 METAL LADDERS

- A. General:
 - 1. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 - 1. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
 - 2. Rungs: 3/4-inch diameter steel bars.
 - 3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 4. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 - 5. Support each ladder at top and bottom and not more than 60 inches on center with welded or bolted steel brackets.
 - 6. Shop prime exposed steel surfaces of interior ladders, including brackets.

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe, diameter as shown on drawings.
- B. Accessories:
 - 1. Reflective Self-Adhering Striping: High-intensity exterior tape.

- a. 6.1 mil retro-reflective outshines standard engineer grade (2 times brighter).
 - b. Colors: Black, Yellow.
 - c. Manufacturer: Seton; www.seton.com; or accepted equal.
- C. Concrete Fill: As specified in paragraph 2.3.I.

2.9 PIPE DOWNSPOUTS

- A. Fabricate downspouts from galvanized, Schedule 40 steel pipe of sizes indicated. Weld joints and grind smooth. Hold downspouts in position 2-1/2 inch clear of cement plaster walls; and [] clear of steel columns; with galvanized steel bar tabs spacing as shown, and securely fasten to the wall.
- B. Outlet: Vertical, to discharge into downspout boot (or spill to grade), as indicated.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize bearing and leveling plates.

2.11 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items (not indicated to be galvanized) unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Article 2.3.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.13 ALUMINUM FINISHES

- A. As-Fabricated (Mill) Finish: AA-M12.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Steel and miscellaneous metal work shall conform to the applicable requirements of the referenced "Codes and Standards". Details indicated are typical, similar details apply to similar conditions. Check drawings for dimensions, elevation, size, and locations of installations. Supply miscellaneous metal items in ample time for incorporation in the work. Include reinforcing angles, plates, straps, brackets, hangers, clips, lugs, holes, sleeves, shims, other hardware as indicated or required for erection of steel and miscellaneous metal work and as required to complete the work as indicated.

3.2 WELDED CONNECTIONS

- A. Welders shall be certified qualified welders. Welders welding light gage metal shall be qualified for light gage metal welding.
- B. Welded connections shall be made in accordance with AWS D1.1. Perform welding in the shop unless otherwise indicated or specified.
- C. All welds and other connections exposed in the finished work shall be ground and dressed smooth and so that the shape and profile of the item welded is preserved.

3.3 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners

for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.4 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions, overhead doors, and overhead grilles securely to, and rigidly brace from, building structure.
- C. Install miscellaneous metal items as rapidly as the progress of other work will permit. Make splices and field connections with bolts, except where welding or brazing is indicated or approved on the shop drawings. Install fasteners as specified herein.
- D. Set metal work accurately at the established lines and levels. Install work in strict accordance with approved drawings and actual conditions, true and horizontal or perpendicular as the case may be, level and square with angles and edges parallel with related lines of the building.
- E. Anchor bolts, anchors, block-outs and sleeves shall be properly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.
- F. After assembly, the various members forming parts of a completed frame shall be aligned and adjusted accurately before being fastened. Tolerances shall conform to the applicable requirements of AISC "Code of Standard Practice". Contact shall be cleaned before the members are assembled. Poor matching of holes shall be corrected by drilling to the next larger size.

3.5 INSTALLATION OF METAL BOLLARDS

- A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2-mil dry film thickness.

- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

09/21/18

SECTION 05 51 13

METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads or precast epoxy terrazzo treads/risers as indicated.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Section 03 48 19 "Precast Epoxy Terrazzo Stair Treads" for precast epoxy terrazzo finish at stair treads and platforms.
3. Section 05 52 13 "Pipe and Tube Railings" for stair railings and wall mounted hand rails.
4. Section 09 91 00 "Painting" for finish painting of shop primed metal stairs and concrete stair non-slip nosings.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Metal-pan-stair treads.
2. Paint products.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate profile and dimensions of precast terrazzo treads.
5. Provide templates for anchors and bolts specified for installation under other Sections.

- C. Samples for Initial Selection: For products involving selection of color, texture, or design.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 - 1. Preassembled Stairs: Commercial class.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
 - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 - 2. Protect steel members and packaged materials from corrosion and deterioration.
 - 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500 (cold formed).
 - 1. Provide galvanized finish for exterior installations and where indicated.

- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 361A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25, unless another grade is required by design loads; exposed.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30, unless another grade is required by design loads.
- G. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 coating, structural steel, Grade 33, unless another grade is required by design loads.
- H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- I. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.2 FASTENERS

- A. General: Provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Bolts: ASME B 18.2.1.
- F. Plain Washers: Round, ASME B 18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.
- H. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 or Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting."

- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

2.4 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Assemble stairs in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: No evidence of a welded joint.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 - 2. Locate joints where least conspicuous.
 - 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - 4. Provide weep holes where water may accumulate internally.

2.5 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Architectural Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of hollow steel sections or steel channels as indicated on drawings.
 - a. Stringer Size: As indicated on Drawings.
 - b. Provide closures for exposed ends of channel stringers.
 - c. Finish: Shop primed at interior stairs; Galvanized at exterior stairs.
 - 2. Construct platforms of steel plate and miscellaneous framing members as indicated.
 - a. Provide closures for exposed ends of channel and rectangular tube framing.
 - b. Finish: Shop primed at interior stairs; Galvanized at exterior stairs.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness indicated.
 - 1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
 - 2. Steel Sheet: Uncoated, cold rolled steel sheet, at interior stairs.
 - 3. Steel Sheet: Galvanized steel sheet, at exterior stairs.
 - 4. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
 - 5. Attach risers and subtreads to stringers with brackets made of steel angles. Weld brackets to stringers and attach metal pans to brackets by welding.
 - 6. Exterior Stairs: Shape metal pans to include tooled-profile, non-slip nosing.
 - 7. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.6 FABRICATION OF STAIR RAILINGS

- A. Comply with applicable requirements in Section 05 52 13 "Pipe and Tube Railings."

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Exterior Stairs: Galvanized.
 - 2. Interior Stairs: Shop primed.
- B. Finish metal stairs after assembly.

- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint comers, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
 - 1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 - 2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
 - 3. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

- F. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 "Cast-in-Place Concrete."
- 1. Exterior Stairs: Paint recessed grooves at tooled nosings with anti-slip epoxy system as specified in Section 09 91 00 "Painting".

3.3 REPAIR

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

09/21/18

SECTION 05 51 33

METAL LADDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Aluminum access ladders.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 50 00 – Metal Fabrications: Fasteners and installation requirements used to attach ladders to structure.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the construction only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. AA – Aluminum Association.
- C. ASTM International:
 - 1. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. OSHA 1910.27 – Fixed Ladders.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product.
- B. Shop Drawings:
 - 1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. Provide reaction loads for each hanger and bracket.
- C. Qualification Data:
 - 1. Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications and resources.

- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish touchup kit for each type and color of paint finish provided.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
 - 1. Record of successful in-service performance.
 - 2. Sufficient production capacity to produce required units.
 - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
- C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurement before fabrication.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

1.9 WARRANTY

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years from date of Substantial Completion against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.
- B. Manufacturer shall be notified immediately of defective products, and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: O'Keeffe's, Inc.; 325 Newhall St. San Francisco, CA 94124. ASD. Toll Free Tel: (888) 653-3333. Tel: (415) 824-4900. Fax: (415) 824-5900. Email: info@okeeffes.com. Web: <http://www.okeeffes.com>.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 13 – Product Options and Substitutions.

2.2 APPLICATIONS/SCOPE

- A. Fixed Access Ladders:
 - 1. Standard Duty Channel Rail.
 - a. Model 500 as manufactured by O'Keeffe's Inc.

2.3 MATERIALS

- A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
- B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

2.4 FINISH

- A. Interior Fixed Access Ladders: Mill finish. As extruded.

2.5 FABRICATION

- A. Rungs: Not less than 1-1/4 inches in section and 18-3/8 inches long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
 - 1. Rungs shall withstand a 1,500 pound load without deformation or failure.
- B. Channel Side Rails: Not less than 1/8 inch wall thickness by 3 inches wide.
- C. Ladder Safety Post: Retractable hand hold and tie off.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.
- B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.
- C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

08/27/18

SECTION 05 52 13

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe and tube railings.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 05 51 12 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Grout and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide custom bracket as detailed for welded connection to railing and anchor plate, with predrilled holes for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.2 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed).
 - 1. Provide galvanized finish for exterior installations and where indicated.
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5 for zinc coating.
 - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
 - 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated, and capable of withstanding design loads.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting."
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form Changes in Direction as Follows:
 - 1. As detailed.

- J. Close exposed ends of railing members with prefabricated end fittings.
- K. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- M. Provide inserts and other anchorage devices for connecting railings to concrete work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.6 STEEL FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 - 4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."] [SSPC-SP 3, "Power Tool Cleaning."] [requirements indicated below:]
 - 1. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- E. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Shop prime uncoated railings with primers specified in Section 09 91 00 "Painting."
 - 2. Do not apply primer to galvanized surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld steel bar vertical posts to wide flange channel, HSS tube, HSS horizontal spacers, and to HSS top rails, as detailed.

3.5 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets as detailed. Terminate railing ends at walls as detailed. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets to building construction as follows:
 - 1. For steel-framed partitions, use self-tapping screws or machine bolts as indicated, fastened to steel framing or to concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

09/21/18

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Plywood backing panels.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. RIS: Redwood Inspection Service.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.3 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the stone facing only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

APA-The Engineered Wood Association (APA)
American Society for Testing and Materials (ASTM International)
American Wood-Preservers' Association (AWPA)
Redwood Inspection Service (RIS)
U.S. Department of Commerce Product Standard (PS)
West Coast Lumber Inspection Bureau (WCLIB)
Western Wood Products Association (WWPA)
Redwood Inspection Service (RIS)

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Expansion anchors.
6. Metal framing anchors.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Requirements of Regulatory Agencies:

1. Rough carpentry shall conform to the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 23 - Wood.
2. Framing anchors and powder driven fasteners shall be furnished and installed in accordance with the manufacturer's current ICC Evaluation Services Report.

C. Grade Marks:

1. Identify each piece of structural lumber, including timbers 4" by 4" in size and larger, by the official grade mark of WCLIB, or WWPA. Provide qualified lumber grader at the site to stamp members that are not mill stamped.
2. Identify plywood by the official grade mark of APA.
3. Identify pressure preservative treated lumber and plywood with the official grade mark of an independent Testing Agency operating under the overview of the ALSC. Grade stamp shall state retention; statements on grade stamp such as "or to refusal" are not permitted.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in an undamaged condition.
- B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raised above the ground and out of contact with other damp or wet surfaces.
- C. Stack lumber and plywood and provide for air circulation within and around the stacks and under temporary coverings.
- D. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.

1.8 PROJECT CONDITIONS

- A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailers where indicated or as required for integration of work of other trades into the structure.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber:
 - 1. Untreated Lumber: Maximum 19 percent except 25 percent for timbers 5" by 5" in size or larger.
 - 2. Treated Lumber: Maximum 19 percent, except 23 percent for timbers 5" by 5" in size or larger, after pressure treatment.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Manufacturers:
1. Hoover Treated Wood Products, Inc.; www.frtw.com; Exterior Fire-X® Fire Retardant Treated Wood.
 2. Lonza Wood Protection, Inc.; www.dricon.com; FRX® Fire Retardant Treated Wood.
 3. Substitutions: Section 01 25 1`3 – Product Options and Substitutions.
- B. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than **10.5 feet** beyond the centerline of the burners at any time during the test.
1. Treatment shall not promote corrosion of metal fasteners.
 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- D. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- E. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- F. Application: Treat items indicated on Drawings, and the following:
1. Framing for raised platforms.
 2. Concealed blocking.
 3. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.

3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWP.
 5. Spruce-pine-fir (south); WCLIB, or WWP.
 6. Western woods; WCLIB or WWP.
- C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; WCLIB, or WWP.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; WCLIB, or WWP.
 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWP.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels for mounting electrical, data or telephone equipment: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, 3/4-inch nominal thickness unless otherwise indicated.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M, or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

Hilti, Inc.
Powder Power Tool Corp.; Drive-It
Ramset Fastening Systems; Ramset

- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC58 for mechanical anchors in masonry and concrete; and ICC-ES AC193 or ICC-ES AC308 for adhesive anchors in masonry and concrete; as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Simpson Strong-Tie Company Inc.
K. C. Metals Products; Superspeed Connectors
Silver Metal Products, Inc.
USP Structural Connectors.

- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

- 1. Use for interior locations unless otherwise indicated.

- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

- 1. Use for wood-preserved-treated lumber and where indicated.

- D. Stainless-Steel Sheet: ASTM A 666, Type 304.

- 1. Use for exterior locations and where indicated.

2.8 MISCELLANEOUS MATERIALS

- A. Water-Resistive Barrier: As specified in Section 07 25 00.
- B. Self-Adhering Flashings: As specified in Section 07 25 00.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
 - C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
 - D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
 - E. Do not splice structural members between supports unless otherwise indicated.
 - F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches on center.
 - G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches on center with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - I. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
 - J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
 - K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in 2016 California Building Code.
 - 2. ICC-ES evaluation report for fastener.
 - L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- 3.2 WOOD BLOCKING AND NAILER INSTALLATION
- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

08/27/18

SECTION 06 20 23

INTERIOR FINISH CARPENRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 09 91 00 - Painting: Finishing of all finish carpentry work.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

APA-The Engineered Wood Association (APA)
National Electrical Manufacturers' Association (NEMA)
U.S. Department of Commerce, National Institute of Standards and Technology
Woodwork Institute (WI):
1. "North American Architectural Woodwork Standards" current edition.
Wood Moulding and Millwork Producers Association (WMMPA)

1.3 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings of finish carpentry for review. Prepare shop drawings in accordance with the WI "North American Architectural Woodwork Standards (NAAWS)", current edition.
2. Affix the WI Certified Compliance Label to the first page of Millwork Shop Drawings, certifying that the materials will be manufactured in accordance with the Woodwork Institute grade specified.

B. Samples: Submit samples of millwork, exposed woods, and other finish materials and trim specified herein.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Woodworking Standards: Manufacture finish carpentry in accordance with WI "NAAWS" current edition, grades as specified herein.

- B. Lumber and Plywood Standards: Meet the requirements of WI "NAAWS" current edition, grades as specified herein.
- C. Certification: Before delivery to the project site, issue a WI Certified Compliance Certificate indicating that the finish carpentry products furnished fully meet requirements of the grade specified.
 - 1. Upon completion of installation issue a WI Certified Compliance Certificate for installation.
- D. Reinspection: In case of a dispute concerning quality of the finish carpentry, a reinspection of the millwork by a representative of WI shall be conducted at no additional cost to the District.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver materials until project construction is ready for installation. Provide a clean storage area as required by WI "NAAWS" current edition, Section 2 - Care and Storage.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Softwood Lumber: WI "NAAWS" current edition, Section 3 - Lumber, of grades and species specified for the various applications.

2.2 INTERIOR FINISH CARPENTRY

- A. Standing and Running Trim:
 - 1. Transparent Finish: Custom Grade White Maple for transparent finish in accordance with WI "NAAWS" current edition, Section 6 – Interior and Exterior Millwork.
 - 2. Opaque Finish: Custom Grade of any softwood species for opaque finish in accordance with WI "NAAWS" current edition, Section 6 - Interior and Exterior Millwork.
- B. Stock Moldings: Provide stock molding patterns graded under WMMPA WM 4-2004, complying with sections indicated, P-Grade for opaque finish. Provide material as specified herein for standing and running trim.

2.3 HARDWARE

- A. Nails, bolts, washers, nuts, wood screws, lag screws, other fasteners, shall be best suited for their specific condition. Nails shall be steel, common or finished, as required.

2.4 MISCELLANEOUS MILLWORK

- A. Finish carpentry, millwork and miscellaneous items and their related components that are to be furnished are not necessarily individually described. Furnish and install finish carpentry work and miscellaneous items not mentioned or otherwise described in accordance with the intent of the drawings and specifications and as required to complete the work.

2.5 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 - 1. Interior standing and running trim, except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

- C. Back cut end joints in trim members approximately 85 degrees to provide a tight, straight butt joint and stagger joints at least 24-inches apart.
- D. Wherever possible, work materials to completion in the shop. Deliver parts of fabricated items to the site in as few pieces as possible. Fabricate mullions, heads, sills, and jambs in one piece wherever possible. Provide joints within each piece as unapparent as possible.
- E. Members that indicate checking or warping will be rejected. Poor grain combinations will also be rejected on parts that are to be exposed in the work.
- F. Install assembled items in the work carefully and neatly. Scribe as required for tight, straight, fit. Do not force installation. Shim as required for straight, level and plumb finished surfaces.
- G. Wherever possible, set nails in a manner that will leave them unseen in the final work. Do not drive exposed nails home, but set for putty with the proper sized nail set. Hammer marks on finished surfaces will be cause for rejection. Use wood screws only where heads are to be covered by other materials and where they will remain out of sight in the finished work.
- H. Priming and Backpriming: Prime and backprime wood surfaces as specified under Section 09 91 00 and in accordance with WI "NAAWS" current edition. Perform priming and backpriming before such products are installed in the work. Receive proper inspection of all surfaces before additional work is started.
- I. Protect all parts from injury after installation in the work and maintain protection until completion of the entire Project.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Install trim after gypsum-board joint finishing operations are completed.
 - 2. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

09/21/18

SECTION 06 41 16

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Products Installed But Not Supplied Under This Section:

1. Horizontal Sliding Visual Display Units are supplied under Section 10 11 00 and installed under Section 06 41 16.

D. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for steel angle support for cantilevered countertops.
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

- American Iron and Steel Institute (AISI)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM International)
- National Electrical Manufacturers' Association (NEMA)
- Scientific Equipment and Furniture Association:
 1. SEFA 3 – Work Surfaces.
- U.S. Department of Commerce (DOC)
- Woodwork Institute:
 1. WI – *North American Architectural Woodwork Standards 3.1*

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Before framing is completed, hold a meeting of the contractor, the casework manufacturer, casework installer and the framing contractor.
 - 1. Review the locations of backing required for casework installation as shown on the casework shop drawings.
 - 2. Review the method of attachment of the backing to the wall system as shown on the architectural drawings.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.
- B. Shop Drawings:
 - 1. Submit Shop Drawings showing list of materials and hardware, sizes, sections, elevations and details of construction and assembly as required by Woodwork Institute *North American Architectural Woodwork Standards 3.1*, Section 1 – Submittals.
 - 2. Indicate grounds, backing, blocking, sleepers and other items required for the installation of cabinet work which are to be furnished and installed as part of the structure.
 - 3. Affix the Woodwork Institute Certified Compliance Program label to the first page of the Shop Drawings, certifying that the cabinets will be manufactured in accordance with the Woodwork Institute grade specified.
- C. Samples for Initial Selection:
 - 1. Plastic Laminate: Submit samples of each type of plastic laminate, including complete color and pattern range and surface finish.
- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material, and specified edge material applied to one edge.
 - 2. Exposed Cabinet Hardware: Submit one unit of each type and finish. Approved samples may be used in the work.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For the following:
 - 1. Composite wood and agrifiber products.
 - 2. Thermoset decorative panels.

3. High-pressure decorative laminate.
 4. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. It is preferable, but not mandatory, that Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Fabricator of products.
- C. Regulatory Requirements: Wall hung cabinets and floor supported cabinets over 5 feet high shall be braced and anchored in accordance with the 2016 California Building Code (CBC) Title 24 Part 2.
- D. Manufacturing Standards:
1. Cabinets: Manufacture plastic laminate faced cabinet work in accordance with Woodwork Institute *North American Architectural Woodwork Standards 3.1*, latest edition, Section 10, Casework - Laminated Plastic, Custom Grade, except as modified herein.
 2. Plastic Laminate Countertops: Manufacture plastic laminate countertops in accordance with Woodwork Institute *North American Architectural Woodwork Standards 3.1*, latest edition, Section 11, Countertops - Laminated Plastic, Custom Grade.
- E. Certified Compliance:
1. Before delivery to the job site, the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
 2. Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.
 3. At completion of installation, the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
 4. All fees charged by the Woodwork Institute for its Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.
- F. Reinspection: In case of a dispute concerning quality of the casework, a reinspection of the casework by a representative of Woodwork Institute shall be conducted at no additional cost to the Owner.
- G. Certified Seismic Installation Program:
1. Before walls are closed up provide a written Woodwork Institute Certified Seismic Installation Program report confirming that backing is provided in all locations

required for casework installation or identifying those locations where backing is missing or improperly located.

2. On completion of installation provide a Woodwork Institute Certified Seismic Installation Program Certificate, identifying the work covered and certifying that installation meets the requirements of the WI CSIP attachment details and schedules.
3. All fees charged by the Woodwork Institute for their Certified Seismic Installation Program are the responsibility of the millwork installer and shall be included in their bid. Certification is a prerequisite for final acceptance. For further information, visit www.woodworkinstitute.com.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- B. Do not deliver materials until project construction is ready for installation. Provide a clean storage area as required by Woodwork Institute *North American Architectural Woodwork Standards 3.1*, Section 2 – Care and Storage.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "*North American Architectural Woodwork Standards*" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
- B. Grade: *North American Architectural Wood Standards* Custom Grade.
- C. Type of Construction: *North American Architectural Wood Standards* Construction Type A - Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

2.2 MATERIALS

- A. Plastic Laminate: Meet the requirements of NEMA LD3.
 - 1. Horizontal Surfaces: NEMA GP 50 high pressure plastic laminate, nominal 0.050-inch thick, except where postforming type is required provide NEMA PF-42, nominal 0.042-inch thick, conforming to Woodwork Institute *Architectural Woodwork Standards*, Section 4, Article 4.4.7, and Section 10, Article 10.4.5.
 - 2. Vertical Surfaces: NEMA GP-28, nominal 0.028-inch thick.
 - 3. Cabinet Liners: Comply with Woodwork Institute *North American Architectural Woodwork Standards*, Section 10 for Grade specified.
 - 4. Backing Sheets: Comply with Woodwork Institute *North American Architectural Woodwork Standards*, Section 10 for Grade specified.
 - 5. Surface Finish: Satin finish.
 - 6. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - a. As selected by Architect from laminate manufacturer's full range in the following categories:
 - 1) Solid colors: Satin or matte finish.
 - 2) Wood grains: Satin or matte finish.
 - 3) Patterns: Satin or matte finish.
 - b. Vertical Surfaces: **TBD**.
 - c. Horizontal Surfaces: **TBD**.
 - 7. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
 - 8. Acceptable manufacturers or equal:

Formica Corporation
 Micarta Div.
 Nevamar Corporation
 Wilsonart International, Inc.

- B. Core: Combination Core Plywood.
 - 1. Basis of Design Product: Raw, 2 Step ArmorCore® "Blank" panels by States Industries LLC; www.StatesInd.com; or ClassicCore® by Columbia Forest Products.
 - a. Description: ArmorCore panels combine the low weight and high strength advantages of veneer cored panels with the superior flatness and higher density of Medium Density Fiberboard. ArmorCore panels are stiffer, lighter, and stronger than composition panels of equivalent thickness, yet the MDF crossbands match the best composition surface characteristics.
 - b. Performance Specifications:
 - 1) MOE: 630,200 lb/in²
 - 2) MOR: 4,922 lb/in²

- 3) Screw holding, face: 324 lbf.
 - 4) Screw holding, edge: 271 lbf.
 - 5) Weight: 2,656 lbs per MSF of 3/4"
 - 6) Thickness tolerance: +0; -3/64"
- c. Panel thickness: As shown on drawings.
- C. Lumber: In accordance with the North American Architectural Woodwork Standards Grade specified for the product being fabricated. Moisture Content: 6% to 12% for boards up to 2-inch nominal thickness, and shall not exceed 19% for thicker pieces.
- D. Hardboard: Meet or exceed Commercial Standard CS-251 and Fed. Spec. LLL-B-00810, tempered, 1/4-inch thick, smooth both sides. Pre-finish exposed surfaces in color to match cabinet interior, pre-finish opposite surface with neutral color balance coating.
- E. Visible Edges, Exposed and Semi-Exposed: 3mm purified PVC edge bands of size to suit material thickness. Colors of the specified manufacturer if shown on the color legend in the plans shall govern. If the Contractor wishes to substitute for the manufacturer's color already specifically called out in the plans, the substitution is subject to rejection if it does not match the required condition, per the Architect's judgement. In the event the Architect rejects it, the specified color and the manufacturer called out in the color legend shall be provided. Hot melt apply to edges of cabinet ends, shelves, doors, and drawer fronts.
- F. Stainless Steel: AISI 18-8, Type 302 or 304 with a No. 4 satin finish.

2.3 HARDWARE

- A. Hinges: Woodwork Institute Grade 1 as approved for schools and hospitals. Acceptable products or equal:
 - Rockford Process Control; No. 376 or No. 456
- B. Pulls: Surface mounted "U" shaped aluminum, US 28 finish. Acceptable products or equal:
 - Builders Brass Works; 9054
 - Quality Hardware; No. 812
- C. Catches:
 - 1. Doors Without Locks: Magnetic type with aluminum case. Acceptable products or equal:
 - Amerock; #9765
 - Epco; No. EP591
 - 2. Inactive Leaf of Pairs of Doors With Locks: Elbow catch. Acceptable products or equal:
 - Amerock; No. B238-14A
 - Ives 2A-92
- D. Drawer Slides: Full extension type with no deflection, with rolling balls, steel rollers and self-lubricating bearings. For drawers 18-inches wide and less, provide slides with 100-pound capacity. For drawers over 18-inches in width provide slides with 150-pound capacity. Provide drawer slides that have mechanical stops designed to prevent accidental removal of the drawer. Acceptable manufacturers or equal:

Accuride

Grant Hardware Company
Knappe & Vogt

- E. File Drawer Slides: Heavy duty, full extension, 3-section slide, 1/2-inch slide space, 150-pound load capacity. Acceptable manufacturers or equal:

Accuride
Grant Hardware Company
Knappe & Vogt

- F. File Drawer Track and Follower: Acceptable product or equal:

K&V 476T ZC and K&V 476F ZC

- G. Shelf Rests for Bored Hole Shelf Support System: BHMA A156.9, B04013; plastic locking shelf support, 1/4" pin length. Acceptable product or equal:

K&V 339 Series for 3/4" shelves; 340 Series for 1" shelves.

- H. Door and Drawer Locks:

1. General: Deadbolt locks from Olympus Lock, Inc.; www.olympus-lock.com
2. Door and Drawer Locks:
 - a. Cabinet Doors: Olympus Lock **500DR** (Door), with 56-1 bar strike; or Corbin Cabinet Lock 0737 (Door).
 - b. Drawers: Olympus **600DW** (Drawer) with 12-3 angle strike; or Corbin Cabinet Lock 0738 (Drawer).
 - c. Local Distributor Contact: JSwis Sales, Inc. 559-260-0331.
 - d. Cabinet locks are easily rekeyable via set screw cylinder release mechanism. All locks to include: Pin tumbler design with working cylinder slides and forwardly removable cylinders for rekeying without totally disassembling lock body. Furnish 2 keys per lock and bar or slotted strikes as required. Provide spacers as required for flush fit with outside face of casework material. Locks shall be capable of being keyed alike, keyed different and/or master keyed per supplied schedule. Locks will have passed ANSI A156.11 Grade 1 cycle testing.
3. Cam locks shall be easily rekeyable pin tumbler with working top slide and retainer staple.
4. Provide locks on all doors and drawers.
5. Locks for doors and drawers shall be keyed alike for each room and master keyed to comply with the Owner's keying system. Purchase master keyed cylinders from the hardware supplier specified in Section 08 71 00.
6. Metal Strike Plates: Provide cabinet door and drawer locks with metal strike plates to protect against particleboard rip out.

- I. Label Holders: Acceptable product or equal:

Knappe & Vogt; No. K010

- J. Countertop Grommets: Acceptable product or equal:

Hafele; HA 429.99.735

- K. Screws: Straight shank double thread particleboard screws.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FABRICATION

- A. Grade: NAAWS Custom Grade.
- B. Fabricate cabinets to dimensions, profiles, and details indicated.
- C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- E. Cabinets: Fabricate cabinets to meet Woodwork Institute *North American Architectural Woodwork Standards 3.1*, Construction Type A - Frameless, Style 1 - Flush overlay. Provide finished end panels of either applied panels or integral members on exposed ends of cabinets. Close gaps at walls with filler panels not to exceed 3-inches wide.
 - 1. Semi-Exposed Surfaces: Finish semi-exposed surfaces of open cabinets or behind glass doors to match exposed surfaces.
 - 2. Cabinet interiors (other than semi-exposed surfaces) including faces of shelving therein, and interior door faces: Finish with cabinet liner as specified herein, color as selected by the Architect.
- F. Drawer Boxes: Provide with subfronts and applied finish fronts securely fastened, with square corners, edges finished with plastic laminate or 3mm purified PVC. Provide drawers with metal slides as specified.
- G. Doors: Flush overlay type, hinged to swing flat against the face of adjoining cabinet or the side of cabinet, with square corners, and edges finished with plastic laminate or 3mm purified PVC. Notch door or cabinet ends, or divisions to receive hinge.
- H. Door and Drawer Fronts: Vertical grade plastic laminate covered. Core material shall be as specified in paragraph 2.2.B. Finish exposed edges with plastic laminate or 3mm purified PVC, color as selected by the Architect, hot-melt applied.
- I. Shelves: Comply with Woodwork Institute *North American Architectural Woodwork Standards 3.1* and Technical Bulletin 435 for 50 pound per square foot load test.
- J. Toe Kick Base:
 - 1. Typical Cabinets: Furnished and installed under Section 09 65 13.

K. Countertops and Splashes:

1. Plastic Laminate Countertops: Custom Grade in accordance with Woodwork Institute *North American Architectural Woodwork Standards 3.1*, Section 11, plastic laminate covered, including square butt top, exposed edges and ends self-edged. Core material: As specified in paragraph 2.2.B.
2. Front edges: Self Edgeband with Narrow Build Up.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Verify that mechanical, electrical, plumbing, and other building components affecting work in this section are in place and ready.

3.2 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.3 INSTALLATION, GENERAL

- A. General: Install work as specified in Woodwork Institute *North American Architectural Woodwork Standards* and provide a Woodwork Institute Certified Compliance Certificate for installation as specified herein.
- B. Grade: Install cabinets to comply with same grade as item to be installed.
- C. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- D. Install cabinets plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- E. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged at finished cuts.
- F. Secure to ground, stripping, blocking with countersunk, concealed fasteners. Install without distortion so that doors and drawers fit openings and are accurately aligned.
- G. Base Cabinets: Set cabinets straight, plumb, and level. Adjust sub-tops within 1/16-inch of a single plane. Fasten each individual cabinet to floor at toe space, with fasteners spaced 24-inches on center. Bolt continuous cabinets together. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.
1. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16-inch.
- H. Wall Cabinets: Securely fasten to solid supporting material, not plaster, lath, or gypsum board. Anchor, adjust, and align wall cabinets as specified for base cabinets.

1. Reinforcement of stud walls to support wall-mounted cabinets specified in appropriate section, but responsibility for accurate location and sizing of reinforcement shall be coordinated with applicable trade.
- I. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- J. Install finish hardware after all finish work has been completed. Inspect drilling operations for surface splinters or delaminations. Pieces bearing such imperfections will be rejected.

3.4 INSTALLATION OF TOPS

- A. Field Jointing: Where practicable, make in same manner as factory jointing using doweled, splines, adhesives, and fasteners recommended by manufacturer. Locate field joints as shown on accepted shop drawings; factory prepared so there is no project site processing of top and edge surfaces.
- B. Fastening: Use concealed clamping devices for field joints located within 6-inches of front, at back edges and at intervals not exceeding 24-inches. Tighten in accordance with manufacturer's instructions to exert a constant, heavy clamping pressure at joints. Secure tops to cabinets with "Z" type fasteners or equal, using 2 or more fasteners at each front, end, and back.
- C. Workmanship: Abut tops and edge surfaces in one true plane, with internal supports placed to prevent any deflection. Provide flush hairline joints in top units using clamping devices. At joints in epoxy tops, use manufacturer's recommended adhesives and holding devices to provide joint widths not more than 1/16-inch wide at any location, completely filled and flush with abutting edges.
 1. After installation, carefully dress joints smooth, remove surface scratches, clean and polish entire surface.
 2. Provide holes and cutouts as required for mechanical and electrical work.
 3. Provide scribe moldings for closures at junctures of top, curb and splash with walls as recommended by manufacturer for materials involved. Use chemical resistant, permanently elastic sealing compound where recommended by manufacturer.
- D. Plastic Laminate Countertops:
 1. Where no splash occurs, scribe the back edge of the counter top to the wall.
 2. Secure joints in the counter tops with draw bolts, sized and spaced as recommended by Woodwork Institute for Custom Grade counter tops.
 3. Apply adhesive using cold-press method and a pressure of not less than 30 psi.
- E. Coordinate work with Divisions 22, 23 and 26 for Plumbing, Mechanical, and Electrical work to be integrated into casework.

3.5 FIELD QUALITY CONTROL

- A. Provide Woodwork Institute Certified Seismic Installation Program inspection reports and certification as required in Part 1 of this Section.

3.6 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

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SECTION 06 64 01

FIBERGLASS REINFORCED PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fiberglass reinforced plastic (FRP) paneling for wall surfaces, including trim accessories.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring for installing plastic paneling.

1.2 REFERENCES

- A. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title or other designation. Standards subsequently referenced in this Section are referred to by issuing authority abbreviation and standard designation.
- B. ASTM International:
 - 1. ASTM D256 – Standard Test Methods For Determining the Izod Pendulum Impact Resistance of Plastics.
 - 2. ASTM D570 – Standard Test Method For Water Absorption of Plastics.
 - 3. ASTM D638 – Standard Test Method For Tensile Properties of Plastics.
 - 4. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 5. ASTM D5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 - 6. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Crane Composites (Inspired by Kemlite):
 - 1. Installation Guide For FRP Panels #6876.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Conduct preinstallation meeting to clarify Project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 ACTION SUBMITTALS

- A. Product Technical Data: For each type of product required.
- B. Shop Drawings: Showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

- C. Samples: Selection and verification samples for finishes, colors and textures. Submit two samples of each type of panel, trim and fastener.

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
- B. Test and Evaluation Reports: Showing compliance with specified performance characteristics and physical properties.
- C. Manufacturer's Instructions: Manufacturer's Installation Guide for FRP #6876.
- D. Qualifications Statements: For manufacturer and installer.
- E. Environmental Certifications: Certificates for GREENGUARD Indoor Air Quality and Children & Schools Certification.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For installed products including maintenance methods and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Warranty: Warranty documents required in this section.

1.7 MAINTENANCE MATERIALS

- A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 77 00 – Contract Closeout and Final Cleaning.
 - 1. Quantity: Furnish quantity of FRP units equal to 2 percent of amount installed.
 - 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Provider of advanced installer training.
- B. Installer Qualifications:
 - 1. At least five years experience in the installation of fiberglass reinforced plastic panels.
 - 2. Experience on at least five projects of similar size, type and complexity as this Project.
 - 3. Employer of workers for this Project who are competent in techniques required by manufacturer for installation indicated.
- C. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner and Architect approval and acceptance of finish color, texture, pattern, trim, fasteners and quality of installation.
 - 1. Mock-Up Size: Minimum 8 feet wide by full height, including vertical panel seams.

2. Maintenance: Maintain mock-up during construction for quality comparison. Remove and legally dispose of mock-up when no longer required.
 3. Incorporation: Mock-up may be incorporated into final construction upon Owner approval.
- D. Surface-Burning Characteristics: Determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction.
1. Flame-Spread Index: 25 (Class A) or less.
 2. Smoke-Developed Index: 450 or less.
- F. Environmental Certification: GREENGUARD [Indoor Air Quality and Children & Schools Certified.
- 1.8 DELIVERY, STORAGE AND HANDLING
- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to project site.
- B. Storage and Handling: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store panels in a dry indoor location at Project site. Remove any foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.
- 1.9 PROJECT CONDITIONS
- A. Ambient Conditions:
1. Do not begin installation until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete or terrazzo work has dissipated.
 2. During installation, and within 48 hours prior to installation, maintain ambient temperature and relative humidity within limits required by type of panel adhesive used and recommendation of panel adhesive manufacturer.
- 1.10 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace FRP panels that fail within specified warranty period.
1. Failures shall include, but not be limited to substantial defects in material and workmanship, rotting, rusting, corrosion, development of structural surface cracks, or requiring painting or refinishing.
 2. Warranty Period: One year from date of Substantial Completion.
- B. Special Warranty: Installer's standard form in which installer agrees to repair or replace FRP panels that fail due to poor workmanship or faulty installation within the specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

- A. General: Fiberglass reinforced plastic panels complying with ASTM D5319.
 - 1. Low-Emitting Materials: Comply with testing and product requirements of California Department of Health Services standards for Volatile Organic Emissions.
- B. Basis of Design Product: Subject to compliance with requirements provide Crane Composites, Inc.; Innovative Finishes DESIGNS Wall Panel IPSA DESIGNS Class A Fiberglass Reinforced Plastic (FRP) Panels, or comparable product by the following:
 - 1. Marlite; www.marlite.com
- C. Substitutions: Submit substitution request in accordance with Section 01 25 13 - "Product Options and Substitutions."
- D. Product Options:
 - 1. Pattern(s): As selected by Architect from manufacturer's full range.
 - 2. Surface Finish: Smooth.
 - 3. Nominal Thickness: 0.075 inch (1.9 mm).
 - 4. Wall Panel Size: As indicated on drawings.
- E. Performance Criteria (Class A Panels):
 - 1. Flexural Strength: 18,000 psi, ASTM D790.
 - 2. Tensile Strength: 10,000 psi, ASTM D638.
 - 3. Barcol Hardness: 45, ASTM D2583.
 - 4. Impact Strength (IZOD): 8 ft-lb/sq in ASTM D256, showing no visible damage on finish side.
 - 5. Water Absorption: 0.16 percent in 24 hours at 77 deg F, ASTM D570.

2.2 ACCESSORIES

- A. Moldings: Polished aluminum.
- B. Panel Adhesive: As recommended by panel manufacturer for the required substrates.
 - 1. Adhesive shall have a VOC content of 50 g/L or less.
- C. Wall Protection Accessories: One-piece rubber accessories, configured to cover panel edges and corners.
 - 1. Color: As selected by Architect from manufacturer's full product range.
 - 2. Profile: As indicated on drawings, and as selected by Architect from manufacturer's full product range.
- D. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants."

2.3 SOURCE QUALITY CONTROL

- A. Obtain fiberglass reinforced panels, moldings and other accessories from a single manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Comply with manufacturer's product data, including product technical bulletins, and installation instructions in product catalogs and product packaging.
- B. Verify that substrates previously installed under other sections are acceptable for product installation in accordance with FRP manufacturer's instructions.
 - 1. Examine substrate surfaces to determine that corners are plumb and straight, that surfaces are smooth, sound and uniform, that nails or screw fasteners are countersunk, and that joints and cracks are filled flush and smooth with adjoining surfaces.
 - 2. Do not begin panel installation until substrate surfaces are in satisfactory condition.

3.2 PREPARATION

- A. Clean substrates to remove substances that could impair bond of adhesive, including oil, grease, dirt, dust or other contamination.
- B. Condition panels by unpacking and placing in installation space no less than 24 hours before installation.
- C. Lay out paneling before beginning installation. Locate panel joints to provide equal panel widths at ends of walls and so that trimmed panels at corners are not less than 12 inches wide.
 - 1. Mark plumb lines on substrate at panel joint locations for accurate installation.
 - 2. Locate panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

- A. General: Comply with panel manufacturer's Installation Guide #6876.
- B. Cut and drill panels, finished face down, with carbide tipped saw blades or drill bits, or cut with snips.
- C. Install panels with manufacturer's recommended gap for panel field and corner joints.
 - 1. Install panels in a full spread of adhesive. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.
- D. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.
- E. Sealant:
 - 1. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
 - 2. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths.

3.4 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Repair or replace any installed products that have been damaged.
- C. Clean installed panels in accordance with manufacturer's instructions prior to Owner's acceptance.
- D. Remove and lawfully dispose of construction debris from project site.

3.5 PROTECTION

- A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION

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SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. The work of this section includes, but is not limited to, the following:
 - 1. Rubberized asphalt sheet membrane waterproofing at below-grade vertical walls.
 - 2. Prefabricated drainage composite.
 - 3. Protection board.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 03 30 00 – Cast-In-Place Concrete.
 - 2. Section 07 62 00 – Flashing and Sheet Metal.
 - 3. Section 07 92 00 – Joint Sealants.

1.02 REFERENCES

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. ASTM International:
 - 1. ASTM C 836 - Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
 - 2. ASTM D 412 - Standard Test Methods for Rubber Properties in Tension
 - 3. ASTM D 570 - Standard Test Method for Water Absorption of Plastics
 - 4. ASTM D 882 - Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
 - 5. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - 6. ASTM D 1876 - Standard Test Method for Peel Release of Adhesives (T-Peel)
 - 7. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 8. ASTM D 3767 - Standard Practice for Rubber - Measurements of Dimensions
 - 9. ASTM D 5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
 - 10. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials
 - 11. ASTM E 154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.03 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all components of waterproofing system.
- B. Samples: Submit representative samples of the following for approval:
 - 1. Sheet membrane.
 - 2. Protection board.

3. Prefabricated drainage composite.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.
- B. Installer: A firm which has at least 3 years experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
 - 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
 - 2. Protect mastic and adhesive from moisture and potential sources of ignition.
 - 3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
- B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.06 FIELD CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.
- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.07 WARRANTY

- A. Section 01 78 36 – Warranties: Requirements for warranties.
- B. Sheet Membrane Waterproofing: Provide written 5 year material warranty issued by the membrane manufacturer upon completion of the work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
1. GCP Applied Technologies; www.gcpat.com; Product: Bituthene 3000.
 2. Pecora Corporation; www.pecora.com; Product: Duramem 700-SM.
 3. Carlisle Inc.; www.carlislesyntec.com; Product: CCS Miradri 860.
 4. Polyguard Products; www.polyguardproducts.com; Product: Polyguard 650.
 5. W.R. Meadows; www.wrmeadows.com; Product: Mil-Roll.
 6. Tamco; www.tamko.com; Product: TW-60.
 7. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis of Design Product: Bituthene® 3000/Low Temperature Membrane by GCP Applied Technologies.

2.02 MATERIALS

- A. Sheet Membrane Waterproofing: Bituthene® 3000/Low Temperature Membrane by GCP Applied Technologies; a self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation. No special adhesive or heat shall be required to form laps.
- B. Sheet Membrane Waterproofing:

PHYSICAL PROPERTIES FOR BITUTHENE 3000/LOW TEMPERATURE MEMBRANE:

Property	Test Method	Typical Value
Color		Dark gray-black
Thickness	ASTM D 3767 Method A	1.5 mm (0.060 in.) nominal
Flexibility, 180° bend over 25 mm (1 in.) mandrel at -43°C (-45°F)	ASTM D 1970	Unaffected
Tensile Strength, Membrane Die C	ASTM D 412 Modified ¹	325 lbs/in. ² minimum
Tensile Strength, Film	ASTM D 882 Modified ¹	5,000 lbs/in. ² minimum
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 Modified ¹	300% minimum
Crack Cycling at -32°C (-25°F), 100 Cycles	ASTM C 836	Unaffected
Lap Adhesion at Minimum Application Temperature	ASTM D 1876 Modified ²	4 lbs/in. – Bituthene 3000 5 lbs/in. – Low Temp
Peel Strength	ASTM D 903 Modified ³	9 lbs/in.
Puncture Resistance, Membrane	ASTM E 154	50 lbs minimum
Resistance to Hydrostatic Head	ASTM D 5385	200 ft of water
Permeance	ASTM E 96, Section 12 – Water Method	(0.05 perms) maximum
Water Absorption	ASTM D 570	0.1% maximum

Footnotes:

1. The test is run at a rate of 50 mm (2 in.) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).
3. The 180° peel strength is run at a rate of 300 mm (12 in.) per minute.

- C. Prefabricated Drainage Composite: Hydroduct® 220 Drainage Composite by Grace Construction Products. Drainage Composite shall be designed to promote positive drainage while serving as a protection course.
- D. Protection Board:
 - 1. Expanded Polystyrene Protection Board: 25 mm (1 in.) thick for vertical applications with the following characteristics. Adhere to waterproofing membrane with Bituthene Protection Board Adhesive.
 - a. Normal Density: 1.0 lb/ft³.
 - b. Thermal Conductivity, K factor: 0.24 at 40 deg F, 0.26 at 75 deg F.
 - c. Thermal Resistance, R-Value: 4 per 25 mm (1 in.) of thickness.
- E. Waterstop: Adcor™ ES hydrophilic non-bentonite waterstop by Grace Construction Products for non-moving concrete construction joints.
- F. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-In-Place Concrete Substrates:
 - 1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
 - 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
 - 3. Repair bugholes over 0.5 inch in length and 0.25 inch deep and finish flush with surrounding surface.
 - 4. Remove scaling to sound, unaffected concrete and repair exposed area.
 - 5. Grind irregular construction joints to suitable flush surface.
- C. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.03 INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
 - 1. Apply primer at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.

2. Delay application of membrane until primer is completely dry. Dry time will vary with weather conditions.
3. Seal daily terminations with troweled bead of mastic.
4. Apply protection board and related materials in accordance with manufacturer's recommendations.

3.04 CLEANING AND PROTECTION

- A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.
- B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION

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SECTION 07 14 13

HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Hot-applied rubberized asphalt waterproofing including protection board, on between slab horizontal surfaces at second level decks.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete deck and topping slab.
 - 2. Section 05 31 00 "Steel Decking".
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim."
 - 4. Section 07 92 00 "Joint Sealants" for joint sealant, joint fillers, and joint preparation.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)

1.3 SYSTEM DESCRIPTION

- A. Furnish and install a 215-mil thick, reinforced hot-applied rubberized asphalt waterproofing membrane assembly with applicable detailing and accessory products per project specifications and drawings, or per waterproofing membrane manufacturer details approved by architect. Waterproofing assembly shall be covered with concrete wearing course per project specifications.

1.4 PREINSTALLATION CONFERENCE

- A. Pre-installation Conference: Conduct a pre-installation conference before commencement of field installation to review conditions, establish procedures to maintain required working conditions and to coordinate this work with related and adjacent work. Representatives of the Contractor, Architect, installer, and manufacturer shall be present at pre-installation conference.
 - 1. Review waterproofing requirements, including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
- C. Samples: Submit product samples representative of the hot-applied rubberized asphalt, reinforcement fabric, protection layer, insulation, filter fabric, and ballast.
- D. Installation Instructions: Submit manufacturer's general and specific installation instructions, recommendations, and limitations.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Certification: Provide letter certifying that materials comply with specific performance characteristics and physical requirements and work has been installed in accordance with specifications and manufacturer's written instructions. Certification must evident that all materials are supplied by a single source manufacturer.
- B. Qualification Data: For Installer.
- C. Sample Warranty: Submit sample copy of manufacturer's waterproofing warranty identifying the terms and conditions.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in primer and liquid membrane shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.
- B. Installer: Installer shall be a company with a minimum of at least 3 years experience in work of the type required by this section and who is an approved applicator as determined by manufacturer.
- C. Materials Manufacturer: A company with a minimum of 20 years in the production of waterproofing materials of type required by this section. Manufacturer shall be capable of providing field service representation during application, and recommending installation methods. Manufacturer shall have certified, approved applicators for membrane installation.
- D. Mockups: Construct minimum 10-ft by 10-ft mock-up of waterproofing membrane incorporating all of the components including: concrete deck, primer, hot applied rubberized asphalt, reinforcement fabric and protection layer. Successful mock-up may remain as part of work.
- E. Maintain copy of manufacturer's installation instructions and MSDS for all products on job-site as well as allow access to the job-site by Owner's Independent Inspector, and Manufacturer Agent.
- F. Owner shall make arrangements and payments for an independent inspection service to monitor installation compliance with the project documents and Manufacturer's published literature, installation instructions, and site specific details. Independent inspection firm shall be a company participating with the Manufacturer's Certified Inspection Program. Inspection

service shall produce reports and digital photographs documenting each inspection. Reports shall be made available in a timely manner to the Installer, General Contractor, Manufacturer, Architect and Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in their original unbroken containers or packages bearing the manufacturer's name, brand designation, date of manufacture and shelf life.
- B. Store materials in an appropriate location and manner as to protect from construction damage, as well as damage from weather, prolonged sunlight, excessive temperature and sources of ignition. Remove all damaged material from project-site and dispose of in accordance with applicable regulations. Do not double stack pallets during shipping or storage. Allow adequate ventilation.
- C. Handling: Handle materials in accordance with manufacturer's instructions. Melting equipment shall consist of double jacketed, oil bath melter with mechanical agitator. Avoid overheating of hot applied rubberized asphalt.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below zero deg F.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. The deck must be properly cleaned and prepared free of any and all contaminations.
- C. The work area shall be adequately ventilated. Warn personnel against breathing of vapors and contact of material with skin and eyes. Limit access to required personnel during the installation process. Do not use flammable products near spark or an open flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs. Wear appropriate protective clothing and respiration protection gear at all times.
- D. Protect adjoining surfaces not to be waterproofed against damage or soiling, including plants, vegetation and animals which may be affected by the waterproofing operations.
- E. Provide adequate protection for membrane after installation. Do not allow any foot or vehicular traffic on unprotected membrane. Do not allow any material or waste products to contaminate membrane. Contact Manufacturer to determine performance impedance, if any, caused by contamination of the membrane.

1.10 WARRANTY

- A. Upon completion of work, provide owner with a single source warranty.
- B. Warranty must be validated by Manufacturer confirming acceptance of installation, including independent inspection reports, in accordance with all applicable instructions.
- C. Manufacturer's HydroShield Warranty:

1. HydroShield Warranty: Upon completion and acceptance of the work required by this section, the waterproofing materials manufacturer will provide a written five (5) year warranty, covering both materials and labor to the project owner.
2. Issuance of Manufacturer's HydroShield Warranty requires the following:
 - a. Waterproofing system products, drainage and insulation course products, and subsequent assembly products shall have been provided by a single manufacturer.
 - b. Installation of waterproofing products, drainage and insulation course products and subsequent products by Manufacturer's Approved Applicator.
 - c. Installation inspected by Independent Inspection Firm per paragraph 1.7.F.
 - d. As applicable, installation of Waterstop-RX in all concrete pour joints. Manufacturer's warranty shall be independent from any other warranties made by the Contractor under requirements of the Contract Documents and may run concurrent with the other warranties.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain waterproofing materials from single source from single manufacturer to ensure system compatibility.
- B. Basis-of-Design Manufacturer and Product: Acceptable product or approved equal:

CETCO - Building Materials Group; www.cetco.com; STRATASEAL HR

2.2 WATERPROOFING MEMBRANE

- A. Membrane shall be STATASEAL HR, a hot applied rubberized asphalt meeting the following physical properties:

<u>Property</u>	<u>Test Standard</u>	<u>Typical Result</u>
Color	No standard test	Black
Solids Content	ASTM D1353	100%
Softening Point	ASTM D96	185°F
Flash Point	ASTM D92	525°F
Water Vapor Permeance	ASTM E96	<0.01 perms-inch
Toughness	CGSB 37.50-M89	>5.5 Joules
Ratio of Toughness to Peak Load	CGSB 37.50-M89	>0.040
Adhesion	CGSB 37.50-M89	Pass
Low temperature crack Bridging capacity	CGSB 37.50-M89	No cracking/no adhesion no splitting
Penetration 0.1mm	ASTM D1191 (1/10mm)	< 100 @ 77°F < 220 @ 120°F

Flow, MM	CGSB-37.50-M89 ASTM D1191	Max 3 @ 60°C 0 @ 120°F
Water resistance	CGSB-37.50-M89 50°C for 4 days	No delamination No blistering No emulsification No deterioration No pin holes
Heat stability	CGSB-37.50-M89	Aged samples No change in viscosity Penetration flow or Low temp flexibility
Low temperature flexibility & adhesion	CGSB-37.50-M89	No cracking No delamination No adhesion loss

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing.
- B. Primer: Primer shall be a surface conditioner for concrete surfaces. Acceptable products or approved equal:
 - Strataprim WB: Water based concrete surface conditioner.
- C. Membrane Reinforcement shall be per manufacturer's standard details: Acceptable product or approved equal:
 - N-Flash: 60-mil uncured neoprene rubber sheet.
 - OR
 - Stratabond 100: 1.5-oz non-woven, spunbonded polyester fabric.
- D. Protection/Separation Layer: Acceptable product or approved equal:
 - RAP 200: 90-mil rubberized asphalt protection course reinforced with synthetic fibers with a sand surface.
- E. Flashing: Acceptable product or approved equal:
 - N-Flash: 60-mil uncured neoprene rubber sheet. N-FLASH flashing applications require the use of bonding adhesive, splicing cement, and lap sealant.
- F. Drainage Course: Consists of a HDPE geonet core with a geotextile fabric integrally bonded to both sides of the core, meeting the following physical properties. Acceptable product or approved equal:
 - Aquadrain G20: 40,000 PSF compressive strength per ASTM D1621 (mod); thickness of 0.25"; 7 gpm/ft width flow capacity per ASTM D4716.
- G. Filter Fabric: 2.65-oz weight non-woven, spunbonded polyester filter fabric. Acceptable product or approved equal:

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer, Owner's Independent Inspector, and manufacturer's representative present; for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Do not start the work of this section until all deficiencies have been corrected. Commencement of work constitutes acceptance of the surfaces and approval by manufacturer's representative of surfaces.

3.2 PROTECTION

- A. Provide workmen with masks and protective clothing as recommended by the waterproofing manufacturer to protect against health hazards.
- B. Do not permit fires, spark producing equipment or smoking within the application area until vapors have dissipated.
- C. Protect adjacent surfaces not indicated to be waterproofed from overspray, splash or spillage by use of drop clothes and masking as necessary.
- D. When applying waterproofing in enclosed spaces, provide adequate ventilation to prevent accumulation of hazardous fumes.

3.3 PREPARATION

- A. Cast-in-place concrete or composition decks must be monolithic, smooth, and free of voids, spalled areas, laitance, honeycombs, and protrusions. New concrete should be cured 28-days with a light brush or wood float finish texture. A steel float finish will provide too smooth of a surface for proper adhesion of the waterproofing materials, therefore concrete surfaces that have a steel float finish must be mechanically treated prior to the application of the waterproof material.
- B. Remove all dirt, debris, oil, grease, cement laitance or other foreign matter which will impair the adhesion and performance of the waterproofing membrane.
- C. Cleaning: Sweep or vacuum surfaces as necessary to remove all dirt and debris.
- D. Protect adjacent work areas and finished surfaces from damage or contamination during installation operations.
- E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, and other voids.

- F. Seal expansion joints with applicable expansion joint material. Detail waterproofing membrane to expansion joint per manufacturer's standard details.
- F. Corners: Install 3/4-inch fillets of sealant at inside corners.

3.4 FLASHING INSTALLATION

- A. Install elastomeric sheets at terminations of waterproofing membrane according to manufacturer's written instructions.
- B. Prime substrate with asphalt primer.
- C. Install elastomeric sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.
- D. Extend elastomeric sheet up walls or parapets a minimum of 6 inches above plaza-deck and 6 inches onto deck to be waterproofed.
- E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of waterproofing.

3.5 APPLICATION

- A. Primer: Apply primer per manufacturer's guidelines to all surfaces to receive waterproofing membrane. Allow primer to dry prior to installing the membrane. Do not allow the primer to pool or become contaminated. Note: Membrane will not adhere properly to wet primer.
- B. Membrane Preparation:
 - 1. Heat membrane waterproofing in a double jacketed, oil bath type tank with mechanical agitation designed for hot applied rubberized asphalt membrane. Do not use single wall, direct fire equipment to heat rubberized asphalt membrane.
 - 2. Heat until membrane can be drawn free flowing and lump free at a temperature range of 320°F to 340°F. Do not exceed safe operating temperature of 375° F. Discard damaged material per applicable regulations.
 - 3. All details and flashings shall be completed in accordance with manufacturer's installation guidelines and detail drawings. Non-moving cracks and joints up to 1/16" require no special treatment.
 - 4. Reinforce all non-moving cracks and joints 1/16" to 3/16" wide with minimum 6" wide strip of flashing material or a minimum 6" wide strip of STATABOND 100 fabric reinforcement embedded in 90-mil thick by 9" wide tack coat of waterproofing material. Embed the reinforcing while the tack coat is still warm and tacky. Overlap reinforcing strip ends a minimum 2", ensuring lap receives rubberized asphalt.
 - 5. Reinforce all non-moving cracks and joints 3/16" to 1/2" in wide with minimum 6" wide strip of flashing embedded in 90-mil thick by 9" wide tack coat of waterproofing material. Embed the reinforcing while the tack coat is still warm and tacky. Overlap reinforcing strip ends a minimum 2", ensuring lap receives rubberized asphalt.
 - 6. Deck-to-Deck Wall Transitions: Install flashing up face of wall as indicated of Drawings and extend flashing onto deck a minimum 6" without wrinkles or fishmouths. Overlap flashing end laps a minimum 6". Apply waterproofing material membrane to deck corner over flashing extending onto horizontal deck; with

STRATABOND 100 reinforcing fabric terminating minimum 1" prior to membrane termination at deck corner.

C. Reinforced Rubberized Asphalt Membrane Installation:

1. Apply minimum 90-mil thick base layer of hot applied rubberized asphalt membrane as a continuous monolithic coat over entire area to be waterproofed; including all crack and joint detailing and flashing interfaces.
2. While the base layer is still warm and tacky, fully embed a layer of STRATABOND 100 reinforcement fabric into the top surface of the 90-mil base coat; overlapping fabric seams a minimum 1/2" to 1" and ensuring a layer of membrane between overlaps. Firmly press the reinforcing fabric into the base layer of membrane.
3. Apply minimum 125-mil thick top layer of hot applied rubberized asphalt membrane over the reinforcing fabric in a continuous monolithic coat. Total minimum membrane thickness shall be 215-mils thick over entire area to be waterproofed.

D. Separation/Protection Layer:

1. While the top layer of hot applied rubberized asphalt membrane is still warm and tacky, unroll and embed the protection layer/separation sheet into the membrane ensuring a good bond.
2. Overlap the laps and seams of the protection layer 3" and seal with hot applied rubberized asphalt in the seams and laps.

E. Water Test:

1. Verify that the structure can withstand the deadload weight of the water test prior to commencement of the water test. If not, then confer with the Manufacturer for alternate testing procedure.
2. Allow hot applied rubberized asphalt membrane to cool.
3. Plug all drains and provide barriers necessary to contain water. Allow for overflow to protect the building in the event of rain.
4. Pond water to a depth of 2" for a period of 48 hours. Inspect for leaks and repair membrane if leaks are found. Repeat water test process after making repairs.
5. Water test must be witnessed, documented and approved by Independent Inspector.

F. Drainage Course: Install over protection course and directly under concrete topping slab.

1. Install drainage course on horizontal and vertical surfaces over protection course in accordance with manufacturers installation procedures. Abutt all drainage core edges and secure with plastic wire straps as required to maintain a continuous layer. Seal all edges by overlapping and then bonding extra fabric flap edges to adjacent drainage course fabric with a general construction adhesive to ensure integrity.
2. Cut drainage sheet to fit close to all perimeter, protrusions and obstructions.

3.6 PROTECTION

- A. Provide adequate protection for membrane after installation. Do not allow any foot or vehicular traffic on unprotected membrane. Do not allow any material or waste products to

contaminate membrane. Contact Manufacturer to determine performance impedance, if any, caused by contamination of the membrane.

3.7 CLEANING

- A. Clean adjacent surfaces of oversprayed, splashed or spilled material. Remove containers and equipment from the site in accordance with Section 01 77 00.

END OF SECTION

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SECTION 07 16 16

CRYSTALLINE WATERPROOFING ADDITIVE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of crystalline waterproofing additive to concrete structures as indicated on the drawings and as specified herein. The crystalline waterproofing material shall be added to concrete during the mixing cycle, and shall be used in topping slabs at second floor exterior decks and patios.
- B. Related Sections:
 - 1. Section 03 20 00 - Concrete Reinforcing.
 - 2. Section 03 30 00 - Cast-in-Place Concrete.
 - 3. Section 07 92 00 - Joint Sealants.

1.02 REFERENCES

- A. Applicable Standards: The following standards are referenced herein.
 - 1. American Society for Testing and Materials (ASTM International).
 - 2. Army Corps of Engineers (CRD).
 - 3. American Concrete Institute (ACI).
 - 4. NSF International (NSF).

1.03 SYSTEM DESCRIPTION

- A. Crystalline Waterproofing Additive: Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. Testing Requirements: Crystalline waterproofing system shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.
- B. Independent Laboratory: Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples.
- C. Crystalline Formation: Crystallizing capability of waterproofing system shall be evidenced by independent SEM (Scanning Electron Microscope) photographs showing crystalline formations within the concrete matrix.
- D. Permeability: Independent testing shall be performed according to U.S. Army Corps of Engineers CRD-C48-73 "Permeability of Concrete". Treated concrete samples shall be pressure tested to 150 psi (350 foot head of water) or 1.05 MPa (106 m head of water). The treated samples shall exhibit no measurable leakage.

- E. Chemical Resistance: Independent testing shall be performed to determine "Sulfuric Acid Resistance of Concrete Specimens". Treated concrete samples (dosage rates of 3%, 5% and 7%) shall be tested against untreated control samples. All samples shall be immersed in sulfuric acid and weighed daily until a control sample reaches a weight loss of 50% or over. On final weighing the percentage weight loss of the treated samples shall test significantly lower than the control samples.
- F. Compressive Strength: Independent testing shall be performed according to ASTM C39 "Compressive Strength of Cylindrical Concrete Specimens". Concrete samples containing the crystalline waterproofing additive shall be tested against untreated control sample. At 28 days, the treated samples shall exhibit a minimum of 10% increase in compressive strength over the control sample.
- G. Potable Water Approval: Independent testing shall be performed according to NSF Standard 61, and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

1.05 SUBMITTALS

- A. General: Submit listed submittals in accordance with the General Construction Provisions and with Section 01 33 00 – Submittals.
- B. Product Data: Submit product data, including manufacturer's specifications, installation instructions, and general recommendations for waterproofing applications. Also include manufacturer's certification or other data substantiating that products comply with requirements of Contract Documents.
- C. Test Reports: Submit, for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.
- D. Manufacturer's Certification: Provide certificate signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply in all respects with the requirements of this specification.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer to be ISO 9001 registered, and to have no less than 10 years experience in manufacturing the crystalline waterproofing additive for the required work. Manufacturer must be capable of providing field service representation during construction phase. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.
- B. Applicator: Installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
- C. Pre-Installation Conference: Prior to installation of waterproofing, conduct meeting with Architect/Engineer, owner's representative, applicator (concrete supplier), concrete placer and waterproofing manufacturer's representative to verify and review the following:
 - 1. Project requirements for waterproofing as set out in Contract Documents.
 - 2. Manufacturer's product data including application instructions.
- D. Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.
- C. Storage: Store waterproofing materials in dry, enclosed location, at temperature and humidity conditions recommended by manufacturer.

1.08 WARRANTY

- A. Project Warranty: Refer to conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be [specify term] years from Date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturer:

Xypex Chemical Corporation
13731 Mayfield Place, Richmond, B.C., Canada V6V 2G9
Tel: 800 961.4477 or 604 273.5265 Fax: 604 270.0451
E-mail: info@xypex.com Website: www.xypex.com
- B. Proprietary Products: Xypex crystalline waterproofing materials as follows:
 - 1. Xypex Admix C-500.
- C. Substitutions: No substitutions permitted.
- D. Source Quality: Obtain proprietary crystalline waterproofing products from a single manufacturer.

2.02 DOSAGE

- A. General: Xypex Admix must be added to concrete mix at time of batching.
- B. Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:

Xypex Admix C-500: 2% – 3% by weight of portland cement content.
- C. For enhanced chemical protection or meeting specific project requirements, or where the concrete mix design contains higher than 20% fly ash content or includes a portland cement/slag cement blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data regarding installation, including technical bulletins, product catalogue, installation instructions and product packaging labels.

3.02 PROJECT CONDITIONS

- A. Reinforcement: All reinforcement shall be rib deformed bar in accordance with applicable standards. Exposed concrete decks (joint free) shall contain sufficient reinforcement to minimize thermal movement and control cracking.
- B. Setting Time and Strength: Some retardation of set may occur when using Xypex Admix products. The amount of retardation will depend upon the concrete mix design, the particular Admix product used, dosage rate of the Admix, temperature of the concrete and climatic conditions. Concrete containing a Xypex Admix product may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine setting time and strength of the concrete. Consult with manufacturer or manufacturer's representative regarding concrete mix design, project conditions and proper dosage rate.
- C. Weather Conditions: For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices as referred to in ACI 305R-10 (Hot Weather Concreting) and ACI 306R-10 (Cold Weather Concreting). For flatwork being placed in either hot, dry or windy conditions use of monomolecular film (evaporation retardant) is recommended to control loss of bleed water.

3.03 APPLICATION

- A. General: Xypex Admix shall be added to the concrete mix at time of batching. Thorough blending of the Xypex Admix throughout the concrete mix is essential for correct performance of the product and, therefore, care should be taken to ensure that a homogeneous mixture is obtained.
- B. Concrete Batching and Mixing: Procedures for mixing will vary according to type of batch plant operation and equipment.
 - 1. Ready Mix Plant - Dry Batching Operation: Add Xypex Admix powder to drum of ready-mix truck, then add 60% - 70% of required water along with 300 - 500 lb. (136 - 227 kg) of aggregate. Mix the materials for 2 - 3 minutes to ensure that the Admix is distributed evenly throughout the mix water. Add balance of materials to the ready-mix truck and mix in accordance with standard batch practices.
 - 2. Ready Mix Plant - Central Mix Operation: Mix Xypex Admix with water to form a very thin slurry (e.g. 15 - 20 lb. or 6.75 - 9 kg of powder mixed with 3 gallons or 13.6 litres of water). Pour the required amount of material in drum of ready-mix truck. The aggregate, cement and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quantity of water that has already been placed in the ready-mix truck). Pour the concrete into the truck and mix for at least 5 minutes to ensure even distribution of the Xypex Admix throughout the concrete.
 - 3. Precast Batch Plant - Pan Type Mixer: Add Xypex Admix to the rock and sand, then mix thoroughly for 2 - 3 minutes before adding the cement and water. The total concrete mass should be blended using standard practices.

3.04 CURING

- A. General: Concrete containing Xypex Admix shall be moist cured in accordance with ACI Reference 308, "Standard Practice for Curing Concrete".
- B. Curing Compounds: Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309.

3.05 PROTECTION

- A. Protection: Protect installed product and finished surfaces from damage during construction.

3.06 FIELD QUALITY CONTROL

- A. Examination for Defects: Do not conceal Xypex treated concrete before it has been observed by Architect / Engineer, waterproofing manufacturer's representative and other designated entities. Concrete shall be examined for structural defects such as faulty construction joints, cold joints and cracks. Such defects to be repaired in accordance with manufacturer's repair procedures.
- B. Flood Testing for Suspended Slabs:
 - 1. Perform flood test on completed waterproofing installation before placement of other construction.
 - 2. Plug or dam drains and fill area with water to a depth of two inches or to within 0.5 inch of top of waterproofing treatment.
 - 3. Let water stand for 24 hours.
 - 4. If leaks are discovered, make repairs and repeat test until no leaks are observed.

3.07 INTERACTION WITH OTHER MATERIALS

- A. Backfilling: Normal backfilling procedures may be used after concrete has been cured for at least seven days. If backfill takes place within seven days after concrete placement, then backfill material shall be moist so as not to draw moisture from the concrete. In no event shall backfilling take place before concrete has gained sufficient strength to withstand the applied load.
- B. Grout, Cement Parge Coat, Plaster or Stucco: Because concrete containing Xypex Admix forms a relatively smooth surface and the resulting crystalline formation fills the concrete pores thereby reducing suction characteristics of the concrete, it may be necessary to use a suitable bonding agent for proper bonding of cementitious systems.
- C. Responsibility to Ensure Compatibility: Xypex Admix products are compatible with most admixtures used in the production of quality concrete. However, Xypex Chemical Corporation makes no representations or warranties regarding such compatibility of Xypex Admix products with other additives or admixtures, nor regarding compatibility of the Xypex treated concrete with coatings, plasters, stuccos, tiles or other surface-applied materials. It shall be the responsibility of the concrete contractor to take whatever measures are necessary, including testing, to ensure compatibility of the Xypex Admix with other additives or admixtures being used in the concrete mix, and it shall be the responsibility of the installer of the surface-applied material that is to be applied over the Xypex treated concrete to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the Xypex treated concrete.

END OF SECTION

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SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.
3. Mineral wool blanket.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 07 22 00 "Roof and Deck Insulation" for rigid roof insulation under standing seam metal roof panels.
2. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.
3. Section 07 84 13 "Penetration Firestopping" for mineral wool firestopping insulation.
4. Section 07 84 43 "Joint Firestopping" for mineral wool firestopping insulation.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Society for Testing and Materials (ASTM International)
U.S. General Services Administration, Federal Specification (FS)
Underwriters Laboratories (UL)

1.3 DESCRIPTION OF INSULATION SYSTEMS

A. Thermal insulation for light gage metal-framed exterior walls:

1. Type: Extruded polystyrene foam-plastic board.
2. Thickness: As shown on drawings.
3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 15 and 140, respectively.
4. Installation Method: Screw attached.

B. Thermal insulation within light gage metal-framed exterior walls:

1. Type: Fire resistant, kraft-foil faced mineral fiber batts or blankets except kraft faced batts or blankets may be used where insulation is fully concealed as defined in the 2016 California Building Code (CBC), Title 24, Part 2, Sec. 720.2.
 2. Thickness: As required to obtain an R-value of not less than R-19.
 3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 4. Installation Method: Taped to face of studs.
- C. Sound retardant insulation within interior partitions and floor framing:
1. Type: Unfaced mineral fiber batts or blankets.
 2. Thickness: Not less than 2-3/4 inches at walls; not less than 6 inches under second floor metal deck with concrete (conditioned spaces).
 3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 4. Installation Method: Friction fit between studs.
- D. Semi-exposed acoustical insulation at underside of metal roof deck:
1. Type: Black-faced fiberglass rolls.
 2. Thickness: 2 inches.
 3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 4. Installation Method: Spindle anchors to underside of deck.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Submit samples of each type of spindle anchor proposed for use.
- C. Manufacturer's Instructions: Submit the manufacturer's printed instructions for installing the spindle anchors for reference.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates of Conformance: Submit certificates from the manufacturer stating that materials meet the R-value and fire resistance and surface burning characteristics specified herein.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.6 REGULATORY REQUIREMENTS

- A. Fire Performance Characteristics: Where insulation is used within a fire rated wall assembly, provide insulation materials which are identical to those whose fire performance

characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, in accordance with methods specified below, by UL or other testing and inspecting agency acceptable to State Fire Marshal.

1. Surface Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 2. Fire Resistance Ratings: ASTM E119.
 3. Combustibility: ASTM E136.
- B. Plastic foam insulation shall comply with the 2016 California Building Code (CBC) Sec. 2603.
- C. Certificate: As required by CBC Title 24, post a certificate containing the building permit number and the insulation manufacturer's name, material identification and R-value and stating that the insulation has been installed in accordance with the drawings and specifications.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver insulation to the site in unopened containers labeled with the manufacturer's name and brand designation and R-value rating.
- B. Store insulation in a dry, well ventilated, water-tight enclosure providing protection from damage. Do not store plastic insulation where it will be exposed to sunlight or to sources of ignition.
- C. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

1.8 SEQUENCING AND SCHEDULING

- A. Do not install insulation until construction has progressed to the point that inclement weather will not damage or wet the insulation material.
- B. Install insulation after electric wiring, plumbing and other concealed work is in place.
- C. Insulation shall not be closed in until it has been inspected and approved.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded-Polystyrene Board: ASTM C 578, Type IV, in manufacturer's standard lengths and widths with tongue-and-groove or shiplap long edges as standard with manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kingspan Insulation; www.kingspaninsulation.com; GreenGuard® Type 4 XPS Insulation Board.
 - b. DiversiFoam Products; www.diversifoam.com; CertiFoam 25 SL.
 - c. Dow Chemical Company (The); www.building.dow.com; Styrofoam™ Brand Tongue and Groove Insulation.
 - d. Owens Corning; www.insulation.owenscorning.com; Foamular XPS Rigid Foam Insulation.
 - 2. Thickness: As shown on drawings.
 - 3. Thermal Resistance: 5-year aged R-value of 5.0 minimum per inch, deg F•ft²•hr/Btu, per ASTM C518.
 - 4. Compressive Strength, per ASTM D1621: 15-25 psi, minimum.
 - 5. Density: 1.5 lb/cu.ft. minimum; 6.15 lb/cu.ft. maximum.
 - 6. Surface Burning Characteristics:
 - a. Flame Spread: 15 (Class A)
 - b. Smoke Developed: 140.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation; www.certainteed.com
 - 2. Johns Manville; www.jm.com
 - 3. Knauf Insulation; www.knaufinsulation.us
 - 4. Owens Corning; www.owenscorning.com
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
- D. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- E. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.3 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced, ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. CertainTeed Corporation; www.certainteed.com
 2. Johns Manville; www.jm.com
 3. Owens Corning; www.owenscorning.com
 4. Thermafiber, Inc.; www.thermafiber.com
 5. Roxul Inc.; www.roxul.com

2.4 AUXILIARY INSULATING MATERIALS

- A. Adhesively Attached, Spindle-Type Anchors:
 1. Zinc-coated steel consisting of a perforated base plate with a projecting split prong of appropriate type and length to penetrate the full thickness of the insulation and be bent back flush with the insulation surface.
 2. Provide one safety washer with each clip fastener.
 3. Adhesive shall be capable of bonding spindle anchors securely to substrates indicated without damaging or corroding insulation, anchors, or substrates. Adhesive shall have a bonding strength of 70 pounds per clip after a 3-day drying time at 70 degrees F and shall have a temperature range of minus 20 degrees to plus 225 degrees F.
 4. Fasteners: Acceptable products or equal:

Stic-Klip Mfg. Co.; Type A or B
Miracle Adhesives Corp.; Miracle Stuk-Ups
Goodloe E. Moore; Gemco or Tuff-Weld
- B. Metal Furring Strips: Z-shaped members of not lighter than 25-gage steel with inner flange not less than 1-3/8 inches wide knurled to accept drywall screws; or an insulation systems consisting of factory grooved polystyrene insulation boards with serrated U-shaped metal furring channels. Acceptable factory grooved polystyrene insulation and serrated U-shaped metal furring channels system or equal:

W. R. Grace and Co.; Thermo-Stud
Dow Chemical Co.; TGIF

- C. Fasteners: Fasteners shall be pneumatically driven fasteners, powder actuated fasteners of concrete stub nails. Fasteners shall be of sufficient length to penetrate at least 1-inch into the masonry substrate.
- D. Duct Tape: As recommended by the insulation manufacturer.
- E. Wire Mesh: Wire mesh shall be hexagonal zinc-coated steel poultry netting having a 1-1/2 inch mesh size and 0.048-inch diameter (18-gage) wire, conforming to ASTM A390.
- F. Line Wires: Soft annealed steel with light zinc coated finish not lighter than 16-gage.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Where possible, recess foil faces 3/4-inch from face of framing members. Set units with facing placed toward interior of construction.
- C. Kraft and Foil Faced Blankets: Where possible, recess foil faces 3/4-inch from face of framing members. Tape flanges to metal framing members. Maintain kraft or foil facings intact or patch all tears or holes using plastic tape or other approved means.
 1. Between Metal Framing Members: Size insulation to fit tightly between light gage metal framing. Where insulation is cut to fit small or irregular spaces, cut the insulation slightly larger than the space to ensure a tight friction fit. Insert blankets between the studs from the inside face of the wall, recessed slightly from the face of the studs. Where blankets are not adequately supported by friction, attach the blankets with tape, adhesive, 9/16-inch long divergent point staples located at four corners and center of each blanket, or tie wires spaced not more than 36-inches on center.
 2. To Underside of Concrete or Metal Deck: Cut insulation to fit between structural steel framing and to completely cover underside of floor decks. Weld clip fastener to underside of metal deck. Apply adhesive to the underside of concrete deck and set clip fasteners in adhesive as recommended by the insulation manufacturer. Space fasteners in accordance with the insulation manufacturer's recommended pattern but not to exceed one fastener for each 4-square feet of insulation. After curing of adhesive, install insulation over fasteners and bend the split prongs flush with the insulation to secure. Butt all edges of insulation and seal edges with tape.
- D. Unfaced Batts and Blankets: Where insulation is cut to fit small or irregular spaces, cut the insulation slightly larger than the space to ensure a tight friction fit. Insert blankets between the studs from the inside face of the wall, recessed slightly from the face of the studs. Where blankets are not adequately supported by friction, attach the blankets with adhesive, 9/16-inch long divergent point staples located at four corners and center of each blanket, or with tie wires spaced not more than 36-inches on center.
- E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.4 INSTALLATION OF FOAM-PLASTIC BOARD INSULATION

- A. General: Install rigid insulation board of the thickness indicated on exterior side of framed exterior metal stud walls where indicated, and as detailed.
- B. Comply with manufacturer's written instructions.
- C. Install insulation sheathing horizontally with tongue up.
- D. Anchor to metal studs with Type S screws at 8" on center along each stud.
- E. Fit around openings and penetrations.
- F. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.
- G. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

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SECTION 07 22 00

ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Rigid roof insulation over metal roof decks.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 31 00 "Steel Decking".
 - 2. Section 07 21 00 "Thermal Insulation."
 - 3. Section 07 41 13.16 "Standing Seam Metal Roof Panels."
 - 4. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing" for rigid roof insulation beneath TPO roofing.

1.2 REFERENCES

- A. The editions of specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International
General Services Administration Federal Specifications (Fed. Spec.)

1.3 ACTION SUBMITTALS

- A. Product Data: Submit certificates of conformance, certified test reports or other data indicating conformance of insulation with the applicable reference standards.
- B. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Use only insulation materials acceptable to the standing seam metal roofing system manufacturer.
- B. Regulatory Requirements:
 - 1. CalGreen Requirements: Materials shall comply with environmental requirements of 2016 California Building Code (CBC) Title 24 Part 11.
 - 2. UL Listing: Provide insulation materials that have been listed by Underwriters Laboratories, Inc. (UL) as approved for use in construction of Class A roof coverings.
 - 3. Provide insulation materials used over metal deck listed by Underwriters Laboratories or Factory Mutual as part of a roof deck construction that has been evaluated for spread of fire on the underside and for wind uplift of Class 1-90.

- C. Where insulation is a component of a guaranteed roofing system as specified in Section 07 41 13.16 provide insulation as manufactured by the roofing system manufacturer, or approved by him for use in the guaranteed roofing system. Installer shall be the same installer as used for the roofing system and approved by the roofing materials manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Deliver insulation to the site in unopened containers labeled with the manufacturer's name and brand designation.
- B. Storage:
 - 1. Do not store insulation in the building until masonry, plaster and concrete are dry and the building has reached the prevailing relative humidity of the locality.
 - 2. Store insulation elevated off the ground in dry weather-tight enclosures or under weather-tight tarpaulins. Provide adequate ventilation to avoid condensation.

1.6 PROJECT CONDITIONS

- A. Do not apply insulation when the ambient temperature is below 40-degrees F or when conditions indicate that temperature may fall below 40-degrees F within 24 hours.
- B. Do not apply insulation when there is surface moisture or visible dampness on the roof deck.

PART 2 - PRODUCTS

2.1 RIGID BOARD INSULATION

- A. Provide insulation that is approved in writing by insulation manufacturer for use as part of a standing seam metal roofing system and is approved by standing seam metal roofing manufacturer for use with specified roof materials. Provide rigid board insulation that complies with the following:
 - 1. Polyisocyanurate complying with product standard ASTM C1289 Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, Type II, Class 1, Grade 2; minimum compressive strength 20 psi.
 - 2. California State Insulation Quality Standards and Title 25 Foam Flammability Criteria.
 - 3. Applicable sections of the California Building Code with regard to foam insulation.
 - 4. UL labeled and listed in applicable UL publications as meeting the applicable flame spread and smoke development rating. Testing shall be in accordance with ASTM E 84.
 - a. Compliance with flame spread and smoke developed ratings is not required when insulation has been tested as part of a roof construction assembly of type specified for this project and assembly is listed as fire-classified as specified herein in applicable UL publications.
 - b. Comply with CBC 2603.3, Surface-burning Characteristics, Exception 3: "Foam plastic insulation that is part of a Class A, B, or C roof-covering assembly provided the assembly with the foam plastic insulation satisfactorily

passes NFPA 276 or UL 1256. The smoke-developed index shall not be limited for roof applications.”

5. Maintain a maximum panel size of 4-feet by 4-feet.
- B. Thickness of Insulation: As shown on drawings.
- C. Acceptable products:
 1. Johns Manville; www.jm.com; Enrgy 3[®] Polyisocyanurate Roof Insulation.
 2. RMax; www.rmax.com; Multi-Max[®] FA-3 Polyisocyanurate Roof Insulation.
 3. Substitutions: Section 01 25 13 “Product Options and Substitutions.”

2.2 ROOF SHEATHING BOARD

- A. GP Gypsum; www.buildgp.com; DensDeck[®] DuraGuard Roof Board; Minimum thickness 1/2-inch unless otherwise noted on the Drawings.

2.3 OTHER MATERIALS

- A. Adhesive: WTT Systems; www.wttus.com; Millenium Weather-Tight[®] One Step[™] Foamable Adhesive.
 1. Description: A highly elastomeric, two component, one step, all purpose, foamable adhesive that contains no solvents and sets in minutes.
 2. Characteristics:
 - a. Physical State: Liquid.
 - b. Color: Light Amber.
 - c. Viscosity: 3,200 – 11,000 cPs.
 - d. Flash Point: >350°F.
 - e. Tack Free Setup: 4-9 minutes.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine deck substrates to ensure that the following conditions are met:
 1. Nailers the same thickness as insulation have been provided at eaves, edges, and roof openings for securing cant strips, gutters, and flashing flanges.
 2. Work that requires penetration of the deck has been completed.
 3. Steel deck panels are properly secured to structural members and to each other and surfaces of top flanges are flat or slightly convex.
- B. Do not proceed with installation of insulation until such deficiencies have been corrected.

3.2 PREPARATION OF SURFACES

- A. Sweep deck surfaces to remove all loose particles and debris.

3.3 INSTALLATION OF INSULATION

- A. Install roof insulation in not less than 2 layers with joints of each succeeding layer parallel and offset in both directions with respect to the layer below.
- B. First Layer on Metal Decks: Apply first layer of insulation board directly to the metal deck and secure it to the deck with fasteners spaced as recommended by the manufacturer to meet Underwriters Laboratories or Factory Mutual 1-90 wind uplift requirements. Insulation joints parallel to ribs of deck shall occur on solid surfaces only, not over open ribs.
- C. Subsequent Layer(s): Install additional layer(s) of insulation board as necessary to achieve the specified C-value or thickness. Apply insulation in a mopping of hot asphalt applied at the rate of 25-pounds per 100-square feet.
- D. Screw Penetration: Screws must penetrate the metal deck a minimum of 3/4" unless applicable standards and recommendations require the screws to penetrate the metal deck more than 3/4".
- E. Applicable Guidelines for Installation:
 - 1. When using multiple layers of rigid board insulation, joints of each succeeding layer shall parallel and vertically offset in both directions with respect to the layer below.
 - 2. Insulation joints parallel to ribs of deck shall occur on solid surfaces only, not over open ribs.
 - 3. Install rigid board insulation and roof sheathing board with sides and ends touching along their lengths. Stagger end joints between adjacent rigid board insulation panels and roof sheathing board, and edges of abutting rigid board insulation panels or roof sheathing board should be in moderate contact.
 - 4. Cut and miter rigid board insulation and roof sheathing boards to fit, and fill neatly all surfaces including ridges, irregular surfaces, perimeter blocking and protrusions. Remove rigid board insulation or roof sheathing boards with broken corners or similar defects and replace with new.
 - 5. The maximum deviation between adjacent rigid board insulation panels or roof sheathing boards shall be 1/16 inch.

END OF SECTION

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SECTION 07 25 00
WEATHER BARRIERS

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. This Section specifies self-adhered weather-resistive barriers and accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 09 29 00 – Gypsum Board: Exterior gypsum sheathing substrate for weather-resistive barrier.

1.02 REFERENCE STANDARDS

- A. Air Barrier Association of America (ABAA):
 - 1. ABAA - Installer's Certification Program.
 - 2. ABAA - Water-resistive Barrier Installation Guideline.
- B. American Association of Textile Chemists and Colorists (AATCC):
 - 1. AATCC 127 - Water Resistance: Hydrostatic Penetration Test.
- C. American Architectural Manufacturer's Association (AAMA):
 - 1. AAMA 711 - Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products.
- D. ASTM International (ASTM):
 - 1. ASTM D1922 - Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.
 - 2. ASTM D3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
 - 3. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - 4. ASTM D5035 - Standard Test Method for Breaking Force and Elongation of Textile Fabrics
 - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E96/96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - 7. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 8. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- E. Canadian Construction Materials Council (CCMC):
 - 1. CCMC Guide MF07102 (2004-09-03) Sect. 6.4.5. Technical Guide for Sheathing, Membrane, Breather-type.
- F. International Code Council (ICC):
 - 1. AC38, Acceptance Criteria for Water-resistive Barriers

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.
- B. Pre-installation Meeting: Convene pre-installation meeting after Award of Contract and one week prior to commencing work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's written installation instructions.
 - 1. Comply with Section 01 31 19 – Project Meetings and coordinate with other similar pre-installation meetings.
 - 2. Notify attendees 2 weeks prior to meeting and ensure meeting attendees include as minimum:
 - a. Owner.
 - b. Architect.
 - c. Weather-resistive barrier installer.
 - d. Manufacturer's Technical Representative.
 - 3. Ensure meeting agenda includes review of methods and procedures related to weather-resistive barrier installation including co-ordination with related work.
 - 4. Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

1.04 ACTION SUBMITTALS

- A. Make submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit product data including manufacturer's literature for weather-resistive barrier membrane and accessories, indicating compliance with specified requirements and material characteristics.
 - 1. Submit list on weather-resistive barrier manufacturer's letterhead of materials, components and accessories to be incorporated into Work.
 - 2. MSDS report.
 - 3. Include product names, types and series numbers.
 - 4. Include contact information for manufacturer and their representative for this Project.
- C. Samples:
 - 1. Submit duplicate 12 x 12 inches sample of membrane.
 - 2. Submit duplicate 12 inches long samples of seam tape and each type of flashing materials.
- D. Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer representative's site visit and inspection.
- E. Installer Qualifications:
 - 1. Submit verification of manufacturer's approval of installer.

1.05 INFORMATIONAL SUBMITTALS

- A. Test Reports:
 - 1. Submit test reports showing compliance with specified performance characteristics and physical properties including air permeance, water vapor permeance and structural performance.

- B. ICC compliance: Submit current ICC-ES Evaluation Report (ESR) verifying compliance with ICC AC38.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Supply maintenance data for weather-resistive barrier materials for incorporation into manual specified in Section 01 78 23 – Operation and Maintenance Data.
- B. Record Documentation: In accordance with Section 01 78 39 – Record Documents:
 - 1. List materials used in weather-resistive barrier work.
 - 2. Warranty: Submit warranty documents specified.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's approval of installer, and 2 years' experience with work similar to work of this Section.
- B. Mock-up: Construct full size 10 ft x 10 ft mock-up of wall showing weather-resistive barrier using proposed procedures, materials and quality of work where directed by Architect and in accordance with Section 01 45 00 – Quality Control.
 - 1. Include examples of window frame, door frame, interior corner, exterior corner and common protrusions or penetrations of barrier membrane.
 - 2. Purpose: To judge quality of work and material installation.
 - 3. Allow Architect 24 hours minimum notice prior to inspection of mock-up.
 - 4. Do not proceed with work prior to receipt of written acceptance of mock-up by Consultant.
 - 5. When accepted, mock-up will demonstrate minimum standard of quality required for work of this Section.
 - 6. Approved mock-up may remain part of finished work.

1.08 DELIVERY STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Deliver material in accordance with Section 01 60 00 – Materials and Equipment.
 - 2. Deliver materials and components in manufacturer's original packaging with identification labels intact and in sizes to suit project.
- B. Storage and Handling Requirements: Store materials off ground and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Ensure materials are protected from sunlight and UV radiation.
- C. Packaging Waste Management:
 - 1. Separate and recycle waste packaging materials in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
 - 2. Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.
 - 3. Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling in accordance with Waste Management Plan.

1.09 WARRANTY

- A. Project Warranty: Refer to Contract Conditions and Section 01 78 36 – Warranties for project warranty provisions.
- B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.
 - 1. 10 years limited material warranty.
- C. Warranty period: 1 years commencing on Date of Substantial Completion.

PART 2- PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Cosella-Dörken Products Inc., 4655 Delta Way, Beamsville, Ontario, L0R 1B4, Canada, Phone: 1-905-563-3255, Toll Free: 1-888-4DELTA4 (1-888-433-5824), e-mail: info@cosella-dorken.com, URL: <http://www.cosella-dorken.com>.
- B. Acceptable Alternate Products:
 - 1. Dupont; www.tyvek.com; Dupont™ Tyvek® CommercialWrap®.
 - 2. Vaproshield; www.vaproshield.com; Wall Shield Integrated Tape.
 - 3. Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.02 DESCRIPTION

- A. Vapor permeable weather-resistive barrier, highly tear-resistant 3-layer membrane, with 2 outer layers of spun-bonded polypropylene fabric, and water-tight vapor permeable polymeric middle layer.

2.03 DESIGN CRITERIA

- A. Comply with ICC AC38.
- B. Water Vapor Permeance: To ASTM E96 (Procedure A), 69 perms; (Procedure B) 120 perms.
- C. Water Vapor Transmission: To ASTM E96 (Procedure A), 472 g/m²/24 hr; (Procedure B) 820 g/m²/24 hr.
- D. Water Penetration: To AATCC 127, Pass.
- E. Air Permeance: To ASTM E2178, <0.0034 cfm/sq ft @ 0.3 inches wg.
- F. Fastener Pull-through Force: To ASTM D3462, 30 lbs.
- G. Breaking Strength: To ASTM D5035, MD 76 lb/2 in, CD 47 lb/2 in minimum.
- H. Elongation at Break: To ASTM D5035, MD 25 %, CD 65 % minimum.
- I. Trapezoidal Tear Strength: To ASTM D4533, MD 22 lb, CD 15 lb minimum.
- J. Water Penetration Resistance: To CAN/CGSB-4.2 #26.3-95, 253 inches.

- K. Tear Resistance: To ASTM D1922, MD 2.4 lb, CD 3.5 lb.
- L. Fire Rating Characteristics: To ASTM E84:
 - 1. Rating: NFPA Class A, IBC Class A minimum.
 - 2. Flame Spread: 25 maximum.
 - 3. Smoke Developed: 105 maximum.

2.04 MATERIALS

- A. Weather-resistive Barrier for Walls: Vapor permeable weather-resistive barrier; highly tear-resistant 3-layer membrane, with two outer layers of spun-bonded polypropylene fabric and a water-tight polymeric middle layer.
 - 1. Weight: 24 lb/roll nominal.
 - 2. Roll Dimensions: 4 feet 11 inches x 164 feet.
 - 3. Color: Matte Gray.
- B. Basis-of-Design Product: Cosella-Dörken Products Inc., DELTA®-VENT S.

2.05 ACCESSORIES

- A. Seam tape: Acrylic-based adhesive tape in accordance with weather-resistive barrier manufacturer's written recommendations.
 - 1. Acceptable material: Cosella-Dörken Products Inc., DELTA®-MULTIBAND (2-1/2" x 65'-7").
- B. Flashings: Self-adhering, butyl-rubber based weather-resistive flashing membrane in accordance with weather-resistive barrier manufacturer's written recommendations.
 - 1. Acceptable material: Cosella-Dörken Products Inc., DELTA®-FLASHING 4" x 75' and 9" x 75'.
- C. Penetration Flashings: Stretchable butyl-rubber based adhesive on non-woven fabric] flashing membrane in accordance with weather-resistive barrier manufacturer's written recommendations.
 - 1. Acceptable material: Cosella-Dörken Products Inc., DELTA®-FLEXX BAND 4" x 33".
- D. Sealants and Adhesives: Elastomeric sealant and adhesive in accordance with weather-resistive barrier manufacturer's written recommendations, and Section 07 92 00 – Joint Sealants.
 - 1. Ensure sealants are compatible with adjacent materials.
 - 2. Acceptable material: Cosella-Dörken Products Inc., DELTA®-THAN; or Dow Corning® 758.
- E. Window Corner: Prefabricated rubber-compound window corner.
 - 1. Acceptable materials: Cosella-Dörken Products Inc., DELTA®-FAS CORNER.
- F. Fasteners: Water and vapor resistant fasteners in accordance with water- resistive barrier manufacturer's written recommendations.
 - 1. 1-5/8" corrosion-resistant screw with 2" minimum diameter plastic caps.

2.06 PRODUCT SUBSTITUTIONS

- A. Ensure all accessories such as seam tape, flashing membranes, window corners, and sealants come from same source as weather-resistive barrier membrane.

- B. Substitutions: In accordance with Section 01 25 13 – Product Options and Substitutions.

PART 3 - EXECUTION

3.01 INSTALLERS

- A. Use only Cosella-Dörken Products Inc. authorized installers for work of this Section.

3.02 EXAMINATION

- A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for weather-resistive barrier installation in accordance with manufacturer's written recommendations.
 - 1. Visually inspect substrate in presence of Consultant.
 - 2. Inform Consultant of unacceptable conditions immediately upon discovery.
 - 3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.03 PREPARATION

- A. Ensure step flashings and kick-out flashings are installed before beginning installation of weather-resistive membrane.
- B. Ensure protrusions that may penetrate weather-resistive barrier membrane are removed before beginning installation.

3.04 INSTALLATION

- A. Install weather-resistive barrier before installation of windows and doors in accordance with manufacturer's written recommendations.
- B. Do installation in accordance with ABAA written recommendations for installation of weather-resistive barriers.
- C. Unroll weather-resistive barrier with printed side out, wrapping entire building, including rough openings for windows, doors and other protrusions or penetrations.
 - 1. Install weather-resistive barrier plumb and level to exterior face of exterior gypsum board in accordance with manufacturer written recommendations.
 - 2. Ensure weather-resistive barrier is installed with textured side facing substrate.
- D. Start installation of weather-resistive barrier at building corner, leaving 6"-12" of membrane extended beyond corner.
- E. Install horizontally starting at bottom of wall.
 - 1. Overlap weather-resistive barrier membrane as follows:
 - a. Exterior Corners: 12 inches minimum.
 - b. Vertical and horizontal seems: 6 inches minimum.
 - c. Other seams, joints or at protrusions and penetrations: 6 inches minimum.
- F. Sill Plate Interface: Extend lower edge of weather-resistive barrier over sill plate interface 3"– 6".

1. Secure to substrate with elastomeric sealant in accordance with weather-resistive barrier manufacturer's written recommendation.
- G. Attachment of Weather-resistive Barrier Membrane to Substrate:
1. Attach weather-resistive barrier to steel studs through exterior sheathing with mechanical fasteners in accordance with manufacturer's written recommendations.
 - a. Secure using fasteners and custom caps spaced 18 inches maximum vertically on center along stud line and 24 inches maximum on center, horizontally.
 - b. Ensure fasteners penetrate securely through metal studs 3/4 inch minimum.
 - c. Install fasteners 6 inches from sill and frame of window and door openings.
 - d. Ensure fasteners are installed 9 inches minimum from window or door head.

3.05 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with Section 01 45 00 – Quality Control.
- B. Manufacturer's Services:
1. Coordinate manufacturer's services with Section 01 45 00 - Quality Control.
 - a. Have manufacturer review work involved in handling, installation, protection, and cleaning of weather-resistive barrier and components, and submit written reports in acceptable format to verify compliance of Work with Contract conditions.
 2. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.
 - a. Report any inconsistencies from manufacturer's recommendations immediately to Consultant.
 3. Schedule site visits to review work at stages listed:
 - a. After delivery and storage of weather-resistive barrier and components, and when preparatory work on which Work of this Section depends is complete, but before installation begins.
 - b. Twice during progress of work at 25% and 60% complete.
 - c. Upon completion of Work, after cleaning is carried out.
 - d. 42 days after installation to ensure weather-resistive barrier has not unnecessarily been left exposed to UV.
 - e. Obtain reports within three days of review and submit immediately to Architect.

3.06 CLEANING

- A. Progress Cleaning: Perform cleanup as work progresses in accordance with Section 01 77 00 – Contract Closeout and Final Cleaning.
1. Leave work area clean at end of each day.
- B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 77 00 – Contract Closeout and Final Cleaning.
- C. Waste Management:
1. Co-ordinate recycling of waste materials with 01 74 19 - Construction Waste Management and Disposal.

2. Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.
3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.07 PROTECTION

- A. Protect installed products and components from damage during construction.
- B. Repair damage to adjacent materials caused by weather-resistive barrier installation.

END OF SECTION

08/27/18

SECTION 07 25 13
VENTILATED RAINSCREEN

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes above-grade ventilated rainscreen for enclosure walls.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections include the following:
 - 1. Section 05 40 00 – Cold-formed Metal Framing: Support for gypsum-type exterior above-grade wall sheathing.
 - 2. Section 09 29 00 – Gypsum Board: Gypsum-type exterior above-grade wall sheathing.
 - 3. Section 09 24 00.13 – Acrylic-Modified Portland Cement Plastering: Ventiladed rainscreen substrate for cement plastering.

1.2 REFERENCES

- A. AATCC 127 (1998) - Water Penetration Resistance.
- B. ASTM International:
 - 1. ASTM C 695 - Standard Test Method for Compressive Strength.
 - 2. ASTM D 1777 - Standard Test Method for Thickness of Textile Materials.
 - 3. ASTM D 5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
 - 4. ASTM D6364 - Standard Test Method for Determining Short-Term Compression Behavior of Geosynthetics.
 - 4. ASTM E 96/96M, Method A - Standard Test Method for Water Vapor Transmission of Materials.
- C. CAN/ULC-S102.2 (2003) - Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions, detail drawings showing ventilation and drainage details, technical data, and tested physical and performance properties.
- B. Shop Drawings: Provide 1/2" = 1' scale drawings (or larger) showing relationship of rainscreen product to:
 - 1. Framing or blocking members.
 - 2. Girts.
 - 3. Thermal insulation.
 - 4. Sheathing.
 - 5. Water-resistive barrier.
 - 6. All exterior cladding and corner conditions.

7. Door and window frames.
8. Balcony and railing penetrations.
9. Structural tie-back penetrations.
10. Pipe, conduit, duct, or any other wall penetrations.

C. Samples:

1. 4" x 4" sample of rainscreen material.
2. Provide materials and fasteners for mock-up.

D. Manufacturer's Instructions: Provide manufacturer's instructions showing the recommended procedures and sequences of installation of the rainscreen product, and storage and handling requirements and recommendations. See www.deltadry.com for downloadable installation instructions.

E. Manufacturer's Product Warranty.

F. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Rainscreen manufacturer shall have an on-going quality control program with inspections by a nationally recognized independent organization.
- B. Source Limitations: Obtain all rainscreen material through one source from a single manufacturer.
- C. Installer Qualifications: Company specializing in performing work of this type, incorporating rainscreen materials.
- D. Manufacturer's Representative Qualifications: Approved or accredited and employed or authorized by rainscreen manufacturer to perform specified field quality control activities.
- E. Pre-installation Meeting: Conduct meeting at project site to comply with requirements in Section 01 31 19 "Project Meetings." Review requirements for rainscreen, including surface preparation specified under other sections, substrate condition and pre-treatment, forecasted weather conditions, special details and flashings, installation procedures, testing and inspection procedures, protection, and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original packaging with seals unbroken, labelled with manufacturer's name, and product brand name.
- B. Store product rolls under cover, on a clean, level surface, either flat or upright.
- C. Provide cover for products while stored on site before installation, protected from direct sunlight and UV exposure.
- D. When products must be stored for extended periods of time, store at temperatures above minus 24 degrees F.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following products:
 - 1. Dual cavity 3-dimensional rainscreen membrane with drainage and ventilation channels. Rainscreen product shall be furnished in standard rolls of 3'-3" wide x 50' long.
 - a. DELTA®-DRY STUCCO & STONE, manufactured by Cosella-Dörken Products, Inc.; www.deltadry.com
 - b. Substitutions: Section 01 25 13 – Product Options and Substitutions. Proposed substitutions must have compressive strength, resistance to solar-driven moisture, vapor permeability, and water penetration resistance of the specified product.

2.2 RAINSCREEN PHYSICAL PROPERTIES

- A. Ventilated Rainscreen for building enclosure: High density polyethylene sheet, dimpled and grooved to provide drainage and ventilation on both sides of sheet, stabilized against oxidation and UV degradation. DELTA®-DRY STUCCO & STONE has a factory pre-installed polypropylene (PP) fabric mortar screen. It is ideal behind absorptive claddings such as manufactured stone and conventional stucco claddings.
 - 1. Product: DELTA®-DRY STUCCO & STONE (Cosella-Dörken)
 - 2. Water penetration resistance: 118 psi, per AATCC 127-1995.
 - 3. Overall thickness: 0.42" at 2 kPa, per ASTM D1777.
 - 4. Compressive strength: 1942 lb/ft², per ASTM D6364.
 - 5. Water vapor transmission: 0.14 perms, per ASTM E96, Method A.
 - 6. Surface burning characteristics:
 - a. Flame spread: 210 – CAN/ULC-S102.2
 - b. Smoke development: 105 – 190 – CAN/ULC-S102.2
 - 7. Contact surface of rainscreen to WRB: 9% (91% open).
 - 8. Contact surface of rainscreen to cladding: 20% (80% open).
 - 9. Color: Silver-grey.

2.3 AUXILIARY MATERIALS

- A. Single-sided Tape:
 - 1. DELTA®-FLEXX-BAND, to repair DELTA®-DRY at damage; distributed by Cosella-Dörken Products, Inc.
- B. Insect Screen: As recommended by the manufacturer of the rainscreen material. Acceptable product: DELTA®-BUG SCREEN. Used at ventilation points to keep insects out.
- C. Fasteners:
 - 1. Corrosion-resistant, knurled shank screws, minimum 1" long.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements and other conditions affecting performance.
- B. Verify that substrates are sound enough to retain fasteners.
- C. Do not begin installation until substrates have been properly prepared.

- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 SURFACE PREPARATION

- A. Clean surfaces “broom clean” prior to installation.
- B. Prepare substrate according to manufacturer's written recommendations for achieving the best result for the substrate under the project conditions.

3.3 RAINSCREEN INSTALLATION

- A. Install DELTA®-DRY STUCCO & STONE in accordance with manufacturer's instructions.
- B. Start at lowest point and work to top, running length of sheets horizontally. The application is to incorporate ventilation at top and bottom of wall, or at least every two stories.
 - 1. Install DELTA®-DRY STUCCO & STONE with stud side facing the water-resistive barrier (WRB).
 - 2. Side laps and end laps shall be placed tightly to the adjacent roll. Do not overlap or interlock DELTA®-DRY STUCCO & STONE.
 - 3. Install sheets without gaps, large wrinkles, creases, or tears.
 - 4. Secure to substrate at edges and in the field of the sheet using fasteners and methods recommended by manufacturer. Fasteners must penetrate into solid backing or sheathing and where possible into studs.
- C. Do not seal or block rainscreen at top or bottom of installation. Leave a minimum 3/8" air gap open for ventilation and proper performance of the wall system.
- D. Provide drop leg shielding of ventilation area to prevent rainwater intrusion due to wind. The length of drop leg shielding is to be determined according to wind/storm for building location.

3.4 FIELD QUALITY CONTROL

- A. Engage an independent inspector to observe substrate and installation.
- B. Contact Cosella-Dörken Products Inc. for field review with contractor to achieve a satisfactory installation by periodic review of the procedures during construction, and evaluating the finished work.

3.5 PROTECTION, REPAIR AND CLEANING

- A. Protect installed rainscreen from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes until completion of project. Do not leave installed rainscreen exposed to sunlight (UV) for more than 30 days after installation.
- B. Prior to installing subsequent construction, inspect DELTA®-DRY STUCCO & STONE rainscreen for tears and other damage, and repair.
- C. Repair torn rainscreen as follows: Any rips, tears or holes in the rainscreen membrane smaller than 2" in diameter should be patched with DELTA®-FLEXX-BAND centered over the tear. Any rips, tears, or holes larger than 2" in diameter should be patched with DELTA®-DRY STUCCO & STONE. Cut a piece of DELTA®-DRY STUCCO & STONE the diameter of the tear. Center the patch over the tear and fasten with approved fasteners or tape edges of patch with DELTA-FLEXX BAND.

- D. Remove mud and similar marks with a water scrub. If chemicals have been spilled on rainscreen, treat as a tear and repair as stated above.

END OF SECTION

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SECTION 07 26 16

BELOW-GRADE VAPOR BARRIER

PART 1 – GENERAL

1.1 SUMMARY

- A. Products supplied under this section:
 - 1. Vapor barrier and installation accessories for installation under concrete slabs.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related sections:
 - 1. Section 03 30 00 – Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 302.1R-15: Guide to Concrete Floor and Slab Construction.
 - 2. ACI 302.2R-06: Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- B. ASTM International:
 - 1. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
 - 2. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 3. ASTM E1643 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - 4. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - 5. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

1.4 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Quality control/assurance:
 - 1. Summary of test results per paragraph 9.3 of ASTM E1745.
 - 2. Manufacturer's samples and literature.
 - 3. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
 - 4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.
 - 5. Contact vapor barrier manufacturer to coordinate a review of the vapor barrier installation either by digital review or in person.

PART 2 – PRODUCTS

2.1 BELOW-GRADE VAPOR BARRIER

- A. Manufacturers:
 - 1. Stego Industries. LLC., www.stegoindustries.com; (877) 464-7834.
 - 2. Approved Alternate: Reef Industries; www.reefindustries.com; Product: Vaporguard.
 - 3. Approved Alternate: PMPC by WR Meadows, 800-342-5976. <http://www.wrmeadows.com/pmpc/>
 - 4. No substitutions.
- B. Product Description and Basis of Design:
 - 1. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC.

2.2 PERFORMANCE REQUIREMENTS

- A. Vapor barrier shall have all of the following qualities:
 - 1. Permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 - 2. Other performance criteria:
 - a. Strength: ASTM E1745, Class A.
 - b. Thickness: 15 mils minimum.
 - 3. Provide documentation that all testing was performed on a single production roll per ASTM E1745, Section 8.1.

2.3 ACCESSORIES

- A. Seam Tape:
 - 1. Stego® Tape by Stego Industries LLC.
 - a. A low permeance tape designed for protective sealing, hanging, seaming, splicing, and patching applications where a highly conformable material is required. It has been engineered to bond specifically to Stego Wrap, making it ideal for sealing Stego Wrap seams and penetrations.
 - b. Composition: Polyethylene film and an acrylic, pressure-sensitive adhesive.
 - c. Roll Size: 3.75 inches wide x 180 feet long.
- B. Vapor-proofing mastic:
 - 1. Stego® Mastic by Stego Industries LLC.
 - a. Designed to be used as a waterproofing and vapor retardant membrane for use in conjunction with Stego Wrap 15-mil Vapor Retarder/Barrier. Stego Mastic can be used as an alternate to boots for pipe penetrations in Stego Wrap Vapor Barrier.
 - b. Composition: A medium-viscosity, water-based, polymer-modified anionic Bituminous/asphalt emulsion.
 - c. Container Size: 2-gallon and 5-gallon buckets.
- C. Perimeter/edge seal:
 - 1. Stego® Crete Claw® by Stego Industries LLC.
 - a. A multi-layered taped that is used to seal Stego Wrap to concrete while the concrete is still wet. Crete Claw allows wet concrete to cast into the textured top surface to form a mechanical bond/seal.

- b. Composition: Polyethylene film, aperture film, and an acrylic pressure sensitive adhesive.
 - c. Roll Size: 6" wide by 180' long.
 - d. Sealing the perimeter with one-sided seam tape is not the preferred method.
- 2. Stego® Term Bar by Stego Industries LLC.
 - a. A semi-flexible plastic termination bar used for mechanically securing Stego Wrap or other materials to concrete, masonry, or wood.
 - b. Composition: Post-industrial recycled PVC.
 - c. Dimensions: 4 feet long x 1-1/8 inches wide
- 3. StegoTack® Tape (double sided) by Stego Industries LLC.
 - a. Double-sided adhesive strip used to bond and seal Stego Wrap to concrete, masonry, wood, metal and other surfaces.
 - b. Composition: Blend of synthetic rubber and resins.
 - c. Total thickness: 30 mils.
 - d. Roll Size: 2 inches wide x 50 feet long.
- D. Penetration Prevention:
 - 1. Beast Foot by Stego Industries LLC.
- E. Vapor Barrier-Safe Screed System:
 - 1. Beast Screed by Stego Industries, LLC.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Ensure that base material is approved by Architect or Geotechnical Engineer.
 - 1. Level and compact base material.

3.2 INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643:
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 - 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At all points of termination (block-outs, interior grade beams, perimeter edge, etc.), seal vapor barrier to the slab itself using Stego Crete Claw, per manufacturer's instructions.
 - 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
 - 4. Apply seam tape/Crete Claw to a clean and dry vapor barrier.
 - 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 6. For interior forming applications, avoid the use of non-permanent stakes driven through the vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier.
 - 7. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
 - 8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
 - 9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

10. For a vapor barrier-safe, fixed-elevation concrete screeding application, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

END OF SECTION

08/27/18

SECTION 07 41 13.16

STANDING SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes standing-seam metal roof panels, gutters, and related accessories.
- B. Related Sections:
 - 1. Section 05 31 00 - Steel Decking.
 - 2. Section 05 40 00 - Cold-Formed Metal Framing: Structural framing supporting metal roofing
 - 3. Section 05 50 00 - Metal Fabrications: Steel pipe downspouts.
 - 4. Section 07 22 00 - Roof and Deck Insulation.
 - 5. Section 07 42 93 - Soffit Panels, for metal panels used in horizontal soffit applications.
 - 6. Section 07 62 00 - Sheet Metal Flashing and Trim.
 - 7. Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society of Civil Engineers:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International:
 - 1. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 3. ASTM C1311 - Standard Specification for Solvent Release Sealants.
 - 4. ASTM D 1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
 - 5. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 6. ASTM D 3575 - Standard Test Methods for Flexible Cellular Materials made from Olefin Polymers.
 - 7. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 8. ASTM E1637 - Standard Specification for Structural Standing Seam Aluminum Roof Panel Systems.
 - 9. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 - 10. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
 - 11. ASTM E 2140 - Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head.
- D. International Code Council:
 - 1. ICC-ES AC166 - Test Procedure for Wind Driven Rain Resistance of Metal Roof

Coverings.

- E. National Coil Coating Association (NCCA).
- F. National Roofing Contractors Association:
 - 1. NRCA - The NRCA Roofing and Waterproofing Manual.
- G. Sheet Metal and Air Conditioning Contractors National Association:
 - 1. SMACNA - Architectural Sheet Metal Manual.
- H. Underwriters Laboratories:
 - 1. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies.
 - 2. UL 1897 - Uplift Test for Roof Covering Systems.

1.3 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-roofing conference approximately two weeks before scheduled commencement of roofing system installation and associated work.
- B. Require attendance of installers of deck or substrate construction to receive roofing, installers of other work in and around roofing which must precede or follow roofing work including mechanical work, Architect, Owner, IOR, and roofing system manufacturer's representative.
- C. Objectives include:
 - 1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
 - 2. Tour representative areas of roofing substrates, inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work.
 - 3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
 - 4. Review roofing system requirements, Drawings, Specifications and other Contract Documents.
 - 5. Review and finalize schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 - 6. Review required inspection, testing, certifying procedures.
 - 7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.
 - 8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

1.4 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Submit product data, test reports, and certifications in accordance with quality assurance and performance requirements specified herein.
- C. Design Loads: Submit manufacturer's minimum design load calculations according to ASCE 7, Method 2 for Components and Cladding. In no case shall the design loads be taken to be less than those specified herein. Calculations must comply with DSA IR A-5.
 - 1. Calculations must account for the lateral load of the solar panels acting on the standing seam in an earthquake.
 - 2. Calculations to be stamped by roofing system manufacturer's California Licensed structural engineer.
- D. Shop Drawings: Prepared specifically for this project; showing dimensions of metal roofing, gutters, accessories, fastening details and connections and interface with other

products.

- E. Selection Samples: For each finish product specified, two complete sets of samples representing manufacturer's full range of available colors and textures.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and textures.
- G. Alternate systems must provide complete DSA submittal package.
- H. Closeout Submittals:
 - 1. Provide manufacturer's maintenance instructions that include recommendations for periodic checking and maintenance of installed roof system.
 - 2. Provide executed copy of manufacturer's warranty.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001 approval.
- B. Installer Qualifications: Certified and approved installer of the sheet metal roofing manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1. Store materials above ground, on skids.
 - 2. Protect material with waterproof covering and allow sufficient ventilation to prevent condensation buildup or moisture entrapment on the materials.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits

recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Warranty:
 - 1. 20 year limited watertight warranty for roofs with a 1:5 to 3:12 slope.
 - a. Warranty shall cover all insulation, underlayment, trim and penetrations.
 - 2. Provide installer's 2 year warranty covering roofing system installation and watertightness.

PART 2 - PRODUCTS

2.1 DESIGN / PERFORMANCE REQUIREMENTS

- A. Standing Seam Roofing System: R-Mer Loc:
 - 1. Thermal Expansion and Contraction:
 - a. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
 - b. Design temperature differential shall be not less than 200 degrees F.
 - c. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
 - d. Location of metal roofing rigid connector shall be at roof ridge unless otherwise approved by the Architect. Metal ridge connector may require design as per job conditions by specified manufacturer.
 - 2. Uniform wind load capacity:
 - a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria:
 - 1. Design Code: ASCE 7, Method 2 for Components and Cladding.
 - 2. Safety Factor: 1.67 after any load reduction or material stress increase.
 - 3. Seismic Design Category D Building, with an Importance Factor of 1.25.
 - 4. Wind Speed: 115 mph.
 - 5. Ultimate Pullout Value: 404 pounds per each of the two fasteners holding the panel anchor to the roof decking or framing system.
 - 6. Exposure Category: C.
 - 7. Design Roof Height: 48 feet.
 - 8. Roof Pitch: 4 inches per foot.
 - 9. Roof Area Design Uplift Pressure:
 - a) Zone 1 - Field of roof: 29.99 psf.
 - b) Zone 2 - Eaves, ridges, hips, and rakes: 36.07 psf.
 - c) Zone 3 - Corners: 62.42 psf.
 - b. ASTM E 1592: Capacity shall be determined using pleated airbag method in accordance with ASTM E 1592, testing of sheet metal roof panels. Allowable

safe working loads shall be determined by dividing the ultimate test load by the safety factor specified above.

3. Uniform Positive Load Capacity:
 - a. Installed roof system shall be capable of resisting the following positive uniform roof loads: Roof Live Load of 20 psf; Roof Snow Load of 0 psf.
 - b. Installed roof system shall carry positive uniform design loads with a maximum system deflection of $L/180$ as measured at the rib (web) of the panel.
4. ASTM E 1680: Static pressure air infiltration (roof panels):
 - a. Pressure Leakage Rate:
 1. 1.57 PSF 0.0054 cfm/sq.ft.
 2. 6.24 PSF 0.0054 cfm/sq.ft.
 3. 20.0 PSF 0.0027 cfm/sq.ft.
5. ASTM E 1646: Static pressure water infiltration (roof panels):
 - a. Pressure Result:
 1. 5 Gal/Hr per S.F. and Static No Leakage.
 2. Pressure of 20.0 Psf. for 15 minutes.
6. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolation for conditions outside test range is not acceptable.
7. Submit third party validation of environmental claims, prepared UL Environment, for all metal roof panels containing recycled content and/or bio based content.

2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Garland Company, Inc. (The), which is located at: 3800 E. 91st St.; Cleveland, OH 44105; Toll Free Tel: 800-321-9336; Tel: 216-641-7500; Fax: 216-641-0633; Web: www.garlandco.com
- B. Alternate Manufacturers: Centria or approved equal.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 25 13 – Product Options and Substitutions.

2.3 STANDING-SEAM METAL PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
- B. R-Mer Loc: Panel with 1-3/4 inch high standing seam with 3/8-inch high clearance between panel and substrate.
 1. Width of Panel:
 - a. 16 inches.
 2. Seam Height: 1-3/4 inch.
 3. Slope at Solid Substrate, no framing components: Slopes down to 1-1/2:12.
 4. Panel Clips: Minimum 18 gauge, galvanized steel or stainless steel. Two-piece clips are unacceptable.
 5. Passes:
 - a. ASTM E 1592.
 - b. ASTM E 1680.
 - c. ASTM E 1646.
 - d. UL (Class 90) 580.
 6. Panel material:
 - a. 24 ga., Galvalume steel, type AZ-55 smooth as per ASTM A792.

7. Flashing and flat stock material: Fabricate in profiles indicated on Drawings of same material, thickness, and finish as roof system, unless indicated otherwise.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 50 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. R-mer Seal by The Garland Company or approved equal.

2.5 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
- B. Accessory Components:
 1. Gable anchor clips shall be minimum 18 gauge, galvanized steel or stainless steel.
 2. Closures: Factory precut closed cell foam meeting ASTM D 1056 or ASTM D 3575, with metal trim matching panels when used at hip, ridge, jamb, and rake.
 3. Provide all miscellaneous accessories for complete installation.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 1. Exposed Coil-Coated Finish:
 - a) Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Color: To match metal roof panels, roof fascia and rake trim.
- E. Hanging Gutters:
 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other special pieces and accessories as required.
 2. Fabricate in minimum 96-inch long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual."
 3. Furnish flat-stock gutter spacers and straps at 24" o.c. fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
 4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
 5. Gutter Profile: As indicated.
 6. Expansion Joints: Butt type with cover plate.
 7. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.

8. Fabricate gutters from 0.040-inch thick aluminum sheet, per par. 2.5.D above.
 9. Finish gutters to match metal roof panels, roof fascia and rake trim.
- F. Downspouts: Steel pipe downspouts as specified in Section 05 50 00 – Metal Fabrications.
- G. Panel Fasteners: Self-tapping screws designed to withstand design loads.
1. Concealed fasteners: Corrosion resistant steel fasteners (zinc plated or equal) designed to meet structural loading requirements. Provide #14 as minimum fastener size.
 2. Exposed fasteners: Series 410 stainless steel fasteners or one-eighth (1/8) inch diameter stainless steel waterproof rivets. All exposed fasteners shall be factory painted to match the color of the standing seam panels.
- H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.6 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Panels and Accessories:
 - 1. Coated Finish:
 - a. Exposed surfaces for coated panels:
 - 1. Two-Coat Fluoropolymer: AAMA 2605. Two coat coil applied, baked-on full-strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
 - b. Unexposed surfaces for coated panels shall be baked-on polyester coating with 0.20 to 0.30 dry film thickness (TDF).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive metal roofing. Notify the Architect in writing of any defective conditions encountered. Starting of work shall constitute acceptance of such conditions.
- B. Structural Deck Substrate:
 - 1. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, and properly sloped.
 - 2. Verify deck is dry and joints are solidly supported and fastened.
 - 3. Verify wood nailers are installed and correctly located. Do not use pressure-treated wood containing salt-based preservatives or materials corrosive to steel.
- C. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.
- D. Correct defective conditions before beginning work.

3.2 INSULATION INSTALLATION

- A. Install insulation and roof cover board as specified in Section 07 22 00 – Roof and Deck Insulation.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 60 days.

1. Apply over the entire roof surface of the standing-seam sheet metal roof panels.
- B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
- F. Install in conformance with the NRCA Roofing and Waterproofing Manual and Manufacturers installation requirements.
- G. Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.
- H. Install underlayment and eave protection sheet underlayment as recommended by the Manufacturer.
- I. Coordinate with installation of rigid board insulation as specified in Section 07 22 00.
- J. Install all panels continuous from ridge to eave. Transverse seams are not permitted.
- K. Panel lengths that exceed maximum shipping lengths shall be field rolled on equipment

owned by the panel manufacturer. Seam sealant must be factory applied.

- L. Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap, if required, and at trim details in accordance with the Manufacturer's requirements.
- M. Where not otherwise indicated conform to SMACNA details including flashings and trim.
- N. Install sealants where indicated to clean dry surfaces only without skips or voids.
- O. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- P. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- Q. Hanging Gutters:
 - 1. Join sections with riveted and soldered or lapped and sealed joints.
 - 2. Provide for thermal expansion.
 - 3. Attach gutters to eave to firmly anchor them in position
 - 4. Provide end closures and seal watertight with sealant.
 - 5. Fasten gutter spacers to front and back of gutter.
 - 6. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
 - 7. Anchor gutter with gutter straps spaced not more than 24 inches o.c. using manufacturer's standard fasteners.
- R. Downspouts: Installation as specified in Section 05 50 00 - Metal Fabrications.
- S. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

SECTION 07 42 13.13

FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Factory formed, concealed-fastener, lap-seam metal wall panels.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 07 42 13.19 – Insulated Metal Wall Panels.
2. Section 07 42 13.23 – Aluminum Composite Panels.
3. Section 07 42 93 – Soffit Panels.
4. Section 07 62 00 – Sheet Metal Flashing and Trim.
5. Section 07 92 00 – Joint Sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, General Contractor, IOR, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review temporary protection requirements for metal panel assembly during and after installation.
7. Review of procedures for repair of metal panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and type of sealants, and any other details as may be required for a weather-tight installation.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, side-seam joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
 3. Distinguish between factory and field-assembled work
- D. Provide factory-painted metal finish samples of manufacturer's standard colors for selection by Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer shall demonstrate experience of a minimum of five (5) years in this type of project.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer must have at least five years successful experience with similar applications.
- C. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Architectural Sheet Metal Manual and National Roofing Contractors Association (NRCA) details applicable to wall panels and wall flashings.
- D. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.
- E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 1. Build mockup of typical metal panel assembly, including corner, supports, attachments, and accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.

- B. Deliver components, sheets, metal soffit panels and other manufactured items so as not to be damaged or deformed. Package metal soffit panels for protection during transportation and handling.
- C. Unload, store and erect metal soffit panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal wall panels on platforms or pallets, covered with suitable weathertight and ventilated covering.
- E. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
- F. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal wall panels by field measurements before fabrication.
- C. Provide field protection at the job site so material is not exposed to weather and moisture.

1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that show evidence of deterioration of factory-applied finish within specified warranty period.
 - 1. Exposed Panels Finish – deterioration includes the following:
 - a. Color fading more than 5 hunter units when tested according to ASTM D 2244 (varies for Award Blue/Cardinal Red)
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214 (varies for Award Blue/Cardinal Red)
 - c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
 - 2. Finish Warranty Period: 20 Years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 WALL PANEL SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance: When tested per ASTM E 1592, withstand the effects of wind loads and deflection limits of the span as indicated on the drawings.
- B. Air Penetration: When tested per ASTM E-283 @ 6.24 PSF the air penetration shall be 0.005 or less when tested in accordance here.
- C. Water Penetration: When tested per ASTM E-331 @ 12.48 PSF for the 15 minute test period, the water penetration shall be none.
- D. Dynamic Water Penetration: When tested per AAMA 501 @ 15 PSF, the water penetration shall be none.
- E. Negative Load Testing per ASTM E-330: The panel shall have been tested per ASTM E-330 to show negative wind uplifts at spans of 1'-0" through 4'-0" spans, both double and triple spans, and the Manufacturer shall provide a Negative Wind Uplift Table for this panel at the above-listed spans, with current 2.0 Safety Factor as per IBC current code and 1.65 Safety Factor as per US Corps of Engineers.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Nominal 16" width with 7/8" high panel corrugations that are mechanically attached to wall supports and do not have any exposed fasteners on the panel face for attachment to the wall supports. Panels can be specified with extended fastening leg.
- C. Basis-of-Design Manufacturer/Product:
 - 1. Peterson Aluminum Corporation, Precision Series HWP Panel, 16" width, 7/8" High, Four-rib profile with concealed extended fastener leg.
 - 2. Substitutions: Section 01 25 13 – Product Options and Substitutions. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.

2.3 MATERIAL

- A. Preformed metal panels shall be fabricated of 22 GA galvalume steel, conforming to ASTM A792/A792M - Standard Specification for Sheet Steel, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
- B. Forming: Use continuous and rolling method. No "portable rollforming" machines will be permitted on this project; no installer-owned or installer-rented machines shall be permitted. It is the intent of the Architect to provide Factory-Manufactured wall panel systems only, for this project.

2.4 MISCELLANEOUS MATERIALS

- A. Zees: Where required by design of primary structural framing system, zeos shall be used to span between beams and/or joists.
- B. Panel Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing

members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system.

- C. Trim: Trim shall be fabricated of the same material and finish to match the profiled sheeting and press broken in lengths of 10 – 12 feet. Trim shall be formed only by the manufacturer or their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
- D. Exposed fasteners shall not restrict free movement of the wall panel system resulting from thermal forces, except at designed points of wall panel fixity. May require the use of PAC factory clips to alleviate thermal movement for panels over 20' in length. Consult PAC factory on use of wall panel clips.
- E. Closures: Use composition or metal profiled closures at top of each elevation to close ends of the panels. Metal closures to be made in the same material and finish as face sheet.
- F. Panel Fasteners: Fasteners shall be galvanized steel, dished washers, galvanized steel with bonded neoprene.
- G. Insulation: See Section 07 21 00 -Thermal Insulation.
- H. Panel Sealants:
 - 1. Provide two part polysulfide class "B" non-sag type for vertical and horizontal joints. Acceptable products: Masterseal® NP-1™, Geocell 2300, Weathermaster "Titebond" or similar performing caulking; or;
 - 2. One part polysulfide not containing pitch or phenolic extenders, or;
 - 3. Exterior grade silicone sealant recommended by panel manufacturer, or;
 - 4. One part non-sag, gun grade, exterior type polyurethane recommended by panel manufacturer.

2.5 FABRICATION

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown and, if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire and performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standards, and according to manufacturer's instructions.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over 0.25 to 0.31 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
2. Color: Selected by Architect from PAC-CLAD *Standard Pac-Clad Finish colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine alignment of structural steel and related supports prior to installation and do not proceed until the defects are corrected by the responsible contractor.
- B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Secure units to supports.
 2. Place fasteners as indicated in manufacturer's standards.

- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- E. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

09/21/18

SECTION 07 42 13.19

INSULATED METAL SPANDREL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Laminated-insulation-core metal spandrel panels.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 07 42 93 "Soffit Panels" for metal panels used in horizontal soffit applications.
2. Section 07 92 00 "Joint Sealants."
2. Section 08 44 13 "Glazed Aluminum Curtain Walls" for curtain walls utilizing insulated metal wall panels as spandrel panels.

1.2 REFERENCES

A. ASTM International:

1. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.
2. ASTM D1781 - Climbing Drum Peel Test for Adhesives.
3. ASTM D2794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
4. ASTM D3359 - Method for Measuring Adhesion by the tape test.
5. ASTM D3363 - Method for Film Hardness by Pencil Test.

1.3 ACTION SUBMITTALS

A. Submittals shall be in conformance with Section 01 33 00.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Detail glazing methods, framing and tolerances to accommodate thermal movement.
3. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples:

1. Panel makeup - 2 samples: 10" x 10."
2. Two samples of each color and finish texture: 3" x 5."

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Affidavit certifying materials meet all requirements as specified.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Panel manufacturer shall have a minimum of 25 years experience.
- B. Field measurements shall be taken prior to completion of manufacturing and cutting.
- C. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" in 20' non-commutative.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits and curtain walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
- 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LAMINATED-INSULATION CORE METAL SPANDREL PANELS

- A. Basis-of-Design Product: Laminated metal-faced MapeSpan™ panels as manufactured by Mapes Architectural Panels, LLC, Lincoln, NE.; www.mapes.com. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into a window system or curtain wall system.
- B. Acceptable alternatives: Panels having similar composite construction and finish providing manufacturer has a minimum of 25 years panel laminating experience and comparable published warranties.

2.2 SUBSTITUTIONS

- A. The materials and products specified in this section establish a minimum standard of required function, design, appearance quality and warranty to be met by any proposed substitution.
- B. No substitutions will be considered unless a written request for approval has been submitted by the bidder and received by the Architect 10 days prior to the bid date.

2.3 FINISH

- A. Finishes:
 - 1. Exterior: 1/4" tempered spandrel glass with ceramic frit on #2 surface. Color as selected by Architect.
 - 2. Interior Skin: Standard Kynar on Steel.
 - 3. Color as selected by Architect from manufacturer's standard colors.

2.4 PANEL COMPONENTS

- A. Exterior Substrate: N/A.
- B. Core: Polystyrene.
- C. Interior Substrate: Tempered Hardboard.
- D. Tolerances: 0.8% of panels dimension length and width: (+/-) 1/16" thickness.

- E. Panel Thickness: 1.0"
- F. R-Value: 4.38.
- G. U-Value: 0.23.

2.5 FABRICATION - GENERAL

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 ACCESSORIES

- A. Recommended for use as an infill panel component in window and curtain wall systems. Related material to complete installation as recommended by the manufacturer.
- B. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20 year life are recommended.

2.7 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Panel surfaces shall be free from defects prior to installation.

3.2 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.
- D. Erect panels plumb, level and true.
- E. Glaze panels securely and in accordance with approved shop drawings and manufacturer's instructions to allow for necessary thermal movement and structural support.
- F. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
- G. Weatherseal all joints as required using methods and materials as previously specified.

3.3 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

09/21/18

SECTION 07 42 13.23

ALUMINUM COMPOSITE PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes aluminum composite material wall/soffit panels.
 - 1. Panel system requirements include the following components:
 - a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete installation.
 - b. Soffits, border, and filler items indicated as integral components of the panel system or as designed.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 40 00 - Cold-Formed Metal Framing: Backup walls.
 - 2. Section 07 21 00 - Thermal Insulation.
 - 3. Section 07 25 13 - Ventilated Rainscreen.
 - 4. Section 07 25 00 - Weather Barriers.
 - 5. Section 07 62 00 - Sheet Metal Flashing and Trim.
 - 6. Section 07 92 00 - Joint sealants.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. Aluminum Association:
 - 1. AA-C22-A41: Anodized - Clear Coatings.
 - 2. AA-C22-A42: Anodized - Integral Color Coatings.
- C. American Architectural Manufacturers Association:
 - 1. AAMA 508-05 - Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems
- D. ASTM International:
 - 1. ASTM B117 - Method of Salt Spray (Fog) Testing.
 - 2. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 3. ASTM D822 - Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.
 - 4. ASTM D1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 5. ASTM D1781 - Climbing Drum Peel Test for Adhesives.

6. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
7. ASTM D 2244 - Calculation of Color Differences from Instrumentally Measured Color Coordinates.
8. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
9. ASTM D2794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
10. ASTM D3359 - Methods for Measuring Adhesion by Tape Test.
11. ASTM D3363 - Method for Film Hardness by Pencil Test.
12. ASTM D4214 - Evaluating the Degree of Chalking of Exterior Paint Films
13. ASTM E84 - Surface Burning Characteristics of Building Materials.
14. ASTM E283 - Rate of Leakage through Exterior Windows, Curtain Walls, and Doors.
15. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads.

E. National Fire Protection Association:

1. NVPA 285 - Intermediate Scale Multi Story Test.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 3 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

E. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Composite Panel Manufacturer: A manufacturer with a minimum of 20 years experience in the manufacturing of this product.
 - 1. Composite Panel Manufacturer shall be solely responsible for panel manufacture and application of the finish.
- B. Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance. Fabricator/installer shall be acceptable to the composite panel manufacturer.
- C. Shop drawings shall show the preferred joint details providing a structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331. Systems not utilizing a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated System) shall provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.
- D. Maximum deviation from vertical and horizontal alignment of erected panels: 1/4" in 20 feet non-accumulative.
- E. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.
- F. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.
- B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal composite material panels during installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Guarantees specified herein are in addition to the general warranty and correction of work requirements of the General Conditions. The guarantees shall be signed by the panel manufacturer and the Contractor and shall be submitted in accordance with Section 01 78 36.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures including rupturing, cracking, or puncturing.
- b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

- C. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
- b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers, or equal:
 - 1. 3A Composites USA, Inc.; www.alucobondusa.com; Alucobond® PE.
 - 2. Alcoa Architectural Products: Reynobond® Aluminum Composite Material (ACM).
 - 3. Citadel Architectural Products; www.citadelap.com; Envelope 2000®.
 - 4. Substitutions: Section 01 25 13 – Product Options and Substitutions.

- B. Basis-of-Design Product: Alucobond PE.

2.2 MATERIALS

- A. Thickness: 4mm (0.157").
- B. Product Performance:
 - 1. Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values:
 - a. Peel Strength: 22.5 in lb/in as manufactured.
22.5 in lb/in after 21 days soaking in water at 70°F.
 - 2. Fire Performance:
 - a. ASTM E84: Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.
 - b. NFPA 285: Panels shall meet requirements of the Intermediate Scale Multi Story Test.

2.3 PANEL FABRICATION

- A. Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.
- B. Aluminum Face Sheets:
 - 1. Thickness: 0.50mm (0.0197") (nominal).
 - 2. Alloy: AA3000 Series (Painted material).
- C. Panel Weight:
 - 1. 4mm (0.157"): 1.55 lbs./ft².
- D. Fabrication Tolerances:
 - 1. Panel Bow: Maximum 0.8% of any 72" panel dimension.
 - 2. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
 - 3. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
 - 4. Maximum deviation from panel flatness shall be 1/8" in 5'-0" on panel in any direction for assembled units. (Non-accumulative - No Oil Canning).
- E. System Characteristics:
 - 1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers,

receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.

2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
5. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
6. The finish side of the panel shall have a removable plastic film applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

F. System Type:

1. Rout and Return Dry: System must provide a perimeter aluminum extrusion with integral weather-stripping as detailed on drawings. No field sealant required in joints unless specifically noted on drawings.

2.4 SYSTEM PERFORMANCE

- A. Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.
- B. Wind Load: If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:
 1. Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E330 to obtain the following results.
 2. Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed $L/175$ or $3/4"$, whichever is less.
 3. Normal to the plane of the wall, the maximum panel deflection shall not exceed $L/60$ of the full span.
 4. Maximum anchor deflection shall not exceed $1/16"$.
 5. At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed $L/100$ of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed $1/16"$.

- C. Air/Water System Test: If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:
1. Air Infiltration: When tested in accordance with ASTM E283, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft² of wall area.
 2. Water Infiltration: Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E331.

2.5 ACCESSORIES

- A. Extrusions, formed members, sheet, and plate shall conform with ASTM B209 and the recommendations of the manufacturer.
- B. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
- C. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.
- D. Fabricate flashing materials from 0.030" minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
- E. Fasteners (concealed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a stripable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 1. Coil coated KYNAR® 500 or HYLAR® 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene – Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605:
 - a. Color: Custom color as selected by Architect, to be matched by the panel supplier.
 - b. Coating Thickness:

- 1) Colors: 1.0 mil (± 0.2 mil).
 - 2) Clear: 0.50 mil (± 0.05 mil).
- c. Hardness: ASTM D-3363; HB minimum using Eagle Turquoise Pencil.
- d. Impact:
- 1) Test method: ASTM D-2794; Gardner Variable Impact Tester with 5/8" mandrel.
 - 2) Coating shall withstand reverse impact of 1.5"/pounds per mil substrate thickness.
 - 3) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
- e. Adhesion:
- 1) Test Method: ASTM D-3359.
 - 2) Coating shall not pick off when subjected to an 11" x 11" x 1/16" grid and taped with #600 Scotch Tape.
- f. Humidity Resistance:
- 1) Test Method: ASTM D-2247.
 - 2) No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4000 hours.
- g. Salt Spray Resistance:
- 1) Test Method: ASTM B-117; Expose coating system to 4000 hours, using 5% NaCl solution.
 - 2) Corrosion creepage from scribe line: 1/16" max.
 - 3) Minimum blister rating of 8 within the test specimen field.
- h. Outdoor Weather Exposure:
- 1) Ten-year exposure at 45° angle facing south Florida exposure.
 - 2) Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.
 - 3) Maximum chalk rating of 8 in accordance with ASTM D-4214.
 - 4) No checking, crazing, adhesion loss.
- i. Chemical Resistance:
- 1) ASTM D-1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
 - 2) ASTM D-1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
 - 3) AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.
1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.
 - a. Verify that water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 INSTALLATION

- A. Erect panels plumb, level, and true.
- B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.
- C. Erect panels in accordance with approved shop drawings.
- D. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
- E. Conform to panel fabricator's instructions for installation of concealed fasteners.
- F. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded, and broken members.
- G. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.
- H. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.
- B. Repair panels with minor damage.
- C. Remove masking (if used) as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor.
- D. Any additional protection, after installation, shall be the responsibility of the General Contractor.
- E. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- F. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION

08/27/18

SECTION 07 42 93

SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal soffit panels.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related work specified elsewhere:
 - 1. Section 07 62 00 - Sheet Metal Flashing and Trim.
 - 2. Section 09 22 16 - Non-Structural Metal Framing.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

AAMA (American Architectural Manufacturers Association)
AISC (American Institute of Steel Construction)
AISI (American Iron and Steel Institute)
ASTM International (ASTM)
General Services Administration Federal Specifications (Fed. Spec.)
SMACNA (Sheet Metal and Air Conditioning Contractors' National Association)

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection:
 - 1. Submit samples and color chips for all proposed finishes.

D. Samples for Verification:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Applicable standards:

1. SMACNA: "Architectural Sheet Metal Manual" Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. AISC: "Steel Construction Manual" American Institute of Steel Construction.
3. AISI: "Cold Form Steel Design Manual," American Iron and Steel Institute.
4. ASTM A792-83-AZ50: Specifications for steel sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (Galvalume).

B. Manufacturer Qualifications:

1. Manufacturer has a minimum of three years' experience in manufacturing metal roof systems of this nature. Panels specified in this section shall be produced in a factory environment (not job site roll formed) with fixed-base roll forming equipment assuring the highest level of quality control. A letter from the manufacturer certifying compliance will accompany the product material submittals.

C. Installer Qualifications:

1. Installation contractor shall be an approved installer, certified by the manufacturer within one year of the beginning of installation of the metal roof system, specifically for MBCI's FlexLoc metal roof system and meet the following minimum criteria:
 - a. Maintain \$250,000 minimum general liability insurance coverage.
 - b. Maintain statutory limits of worker's compensation coverage as mandated by law.
 - c. Has no viable claims pending regarding negligent acts or defective workmanship on previously performed or current projects.
 - d. Has not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.
 - e. Project foreman is the person having received specific training in the proper installation of the specified metal roof system and will be present to supervise whenever material is being installed. Specific training program shall include the following:
 - 1) The instructor must have a minimum of 10 years' experience in the application of metal roof systems.
 - 2) A formal syllabus for the classroom and hands-on training.
 - 3) Classroom instruction with review and thorough understanding of the specific product's technical manual.

- 4) Hands-on mock-up instruction with review and thorough understanding of the specific product's details.
- 5) The installation contractor must pass a written and oral exam.
- f. Provide five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.
- g. Provide certification letter that installation contractor has a minimum of three years' of metal product installation experience immediately preceding the date upon which work is to commence.

D. Installation contractor's qualification:

1. Submit certificate from manufacturer certifying that installer of the metal roof system has met all of the criteria outlined in paragraph 1.7.C "Installer Qualifications" and is an authorized installer certified by the manufacturer within one year of the beginning of installation of the metal roof system.
2. Submit the formal syllabus for the classroom and hands-on training.
3. Submit five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver metal roof system to job site properly packaged to provide protection against transportation damage.
- B. Handling: Exercise extreme care in unloading, storing and erecting metal roof system to prevent bending, warping, twisting and surface damage.
- C. Storage: Store all material and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation of metal roof system to prevent condensation build-up between each panel or trim/flashing component.

1.9 WARRANTY

- A. Special Warranty: Metal roof system manufacturer, upon final acceptance for project, shall furnish a warranty covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure for a period of 20 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form covering paint finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading for a period of twenty (20) years from date of Substantial Completion, for roof panels (premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin).

PART 2 - PRODUCTS

2.1 METAL SOFFIT PANELS

- A. Basis-of-Design Product: MBCI, Atwater, California; (801) 530-4975; www.mbc.com; Flexloc® Soffit Panel, Vented.
 1. Optional manufacturers:
 - a. Berridge Manufacturing - Houston, TX.

- b. Other manufacturers desiring approval, comply with Section 01 25 13.
- B. Metal soffit panel system profile: 9-1/2 inch wide.
- C. Metal soffit panel system style:
 - 1. Flush face.
 - 2. Concealed fastener.
- D. Gauge: 22 gauge.
- E. Substrate: Galvalume steel sheet, 0.5 ounces/square foot, minimum yield 50,000 PSI.
- F. Texture: Embossed (reduces oil canning effect).
- G. Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin.
- H. Color: Selected by Architect from metal roof system manufacturer's standard and custom colors.

2.2 FABRICATION

- A. Material shall be in-line tension leveled prior to roll forming finished panel profile.
- B. Roll form panels in continuous lengths, full length of detailed runs.
- C. Standard panel length shall be no more than 45 feet long (for longer length availability, contact manufacturer).
- D. Fabricate trim/flashing and accessories to detailed profiles.
- E. Fabricate trim/flashing from same material as panel.

2.3 FINISH

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examination:

1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.

B. Discrepancies:

1. In event of discrepancy, notify the architect (owner).
2. Do not proceed with installation until discrepancies have been resolved.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

- A. Install metal panel soffit system so that it is weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
- B. Install metal panel soffit system in accordance with manufacturer's instructions and shop drawings.
- C. Provide concealed anchors at all panel attachment locations.
- D. Install panels plumb, level and straight with seams parallel, conforming to design as indicated.

3.4 CLEANING AND PROTECTION

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the Architect any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions.

END OF SECTION

09/21/18

SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes all, labor, materials, tools, transportation, equipment, services, and facilities necessary for, and reasonably incidental to, the completion of the work as shown on the drawings and/or described in the specifications, for the following scope of work:
 - 1. Modified Bituminous Membrane Roofing installation scope of work:
 - a. Mechanically attach base layers of insulation and install cover board in hot asphalt.
 - b. Install base ply in hot asphalt.
 - c. Install a modified bitumen cap sheet.
 - d. Fabricate and install all sheet metal.
 - e. Install base sheet and mineral surfaced modified membrane at all perimeter and projection baseflashings.
 - f. Coat all roof and flashing surfaces.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 - 3. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
 - 4. Section 22 00 00 "Plumbing" for roof drains.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM B69 - Standard Specification for Zinc Sheet.
 - 2. ASTM D41 - Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
 - 3. ASTM D312 - Specification for Asphalt Used in Roofing.
 - 4. ASTM D5147- Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
 - 5. ASTM E108 - Test Methods for Fire Test of Roof Coverings.

1.3 PREINSTALLATION MEETING

- A. Pre-application Roofing Conference: Approximately 2 weeks before scheduled commencement of modified bituminous membrane roofing system and associated work, meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in the around roofing that must precede or follow roofing work (including mechanical work if any), Owner's representative/Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including

(where applicable) Owner's insurers, test agencies, and governing authorities. Objectives to include:

1. Review foreseeable methods and procedures related to roofing work.
2. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.
3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
4. Review roofing systems requirements (drawings, specifications, and other contract documents).
5. Review required submittals, both completed and yet to be completed.
6. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
7. Review required inspection, testing, certifying, and material usage accounting procedures.
8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).
9. Record (contractor) discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
10. Review notification procedures for weather or non-working days.

1.4 ACTION SUBMITTALS

- A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements. Include data substantiating that materials comply with the minimum specified requirements including rubber content, low temperature flexibility, tensile strength, tear strength, and amount of recycled content (post consumer and post industrial).
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 1. Base flashings and membrane terminations.
 2. Insulation, including slopes.
 3. Crickets, saddles, and tapered edge strips, including slopes.
- C. Samples: Submit four (4) samples of the following:
 1. Cap Sheet.
 2. SBS Modified Base Sheet.
- D. Specimen Warranty: Provide an unexecuted copy of the 30 year No Dollar Limit water tight warranty covering every part of the Built Up Roofing system specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

- E. Any material submitted as equal to or better than the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. This report shall show that the submitted equal meets the Design and Performance criteria in this specification.
- F. Substitution requests submitted without licensed engineer stamp will be rejected for non-conformance.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.
- B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.
- C. Manufacturer's Certificate: Certify that the roof system furnished is approved or accepted by Factory Mutual Approval Standard 4470.
- D. Manufacturer's Certificate: Certify that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.
- E. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.
- F. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.
- G. Written certification from the roofing system manufacturer certifying the applicator is currently authorized for the installation of the specified roof system.
- H. Design Wind Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-10, Method 2 for Components and Cladding, sealed by a registered professional structural engineer employed by the system manufacturer as a full-time staff engineer. In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.
- I. Qualification data for firms and individuals identified in Quality Assurance Article below.
- J. Notarized statement from the Roofing System Manufacturer, signed by an Officer of the Corporation with the Corporate Seal affixed there to stating that the Roofing System Manufacturer will provide field inspections three times a week during the entire period of installation until all construction is completed and to be performed by a full time employee of the manufacturer at no additional cost to the owner.

1.6 CLOSEOUT SUBMITTALS

- A. General: Comply with Requirements of Division 01 Section – Contract Closeout and Final Cleaning; Submittals, Section 01 78 23 – Operation and Maintenance Data, and Section 01 73 36 – Warranties.
- B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.

- C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.
- D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.
- E. Demonstration and Training Schedule: Provide a schedule of proposed dates and times for instruction of Owner's personnel in the maintenance requirements for completed roofing work. Refer to Part 3 for additional requirements.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installer (Roofing) shall be specializing in modified bituminous roof application with minimum 5 years experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.
- B. It is the intent of this specification to provide a roof system with an external fire rating. The descriptions given below are general descriptions. The insulation, recovery board, and other components shall be as required by the membrane manufacturer to provide a Class A fire resistance rating.
- C. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Forman on the job site during all phases of modified bituminous sheet roofing work and at any time roofing work is in progress: proper supervision of workmen shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.
- D. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction.
- E. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).
- C. Do not leave unused rolled goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.
- D. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.9 MANUFACTURER'S INSPECTIONS

- A. When the project is in progress, the Roofing System Manufacturer will provide the following:

1. Keep the Owner's representative informed as to the progress and quality the work as observed.
2. Provide job site inspections a minimum of three days a week.
3. Report to the Owner's representative in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
4. Confirm, after completion of the project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.10 PROJECT CONDITIONS

- A. Weather Condition Limitations: Do not apply roofing membrane during inclement weather or when a 40% chance of precipitation is expected.
- B. Do not apply roofing insulation or membrane to damp deck surface.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- D. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

1.11 SEQUENCING AND SCHEDULING

- A. Sequence installation of modified bituminous sheet roofing with related units of works specified in other sections to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.
- B. All work must be fully completed on each day. Phased construction will not be accepted.

1.12 WARRANTY

- A. Membrane Manufacturer upon completion of installation, and acceptance by the Owner and Owner's representative, the manufacturer will supply to the Owner a 30 year labor and material warranty.
- B. Contractor will submit a minimum of a two year warranty to the membrane manufacturer with a copy directly to Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. When a particular trade name or performance standard is specified it shall be indicative of a standard required. Provide materials by: The Garland Company (Basis-of-Design); Jay Mulligan, (415) 971-2739; or comparable materials/system by CertainTeed; Johns Manville Roofing Systems; GAF; or Tremco Inc.

- B. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified. The Owner's representative/Owner shall be the sole judge as to whether or not an item submitted as an equal is truly equal. Should the contractor choose to submit on the equal basis, he shall assume all risk involved, monetary or otherwise, should the Owner's representative/Owner find it unacceptable.

2.2 DESIGN AND PERFORMANCE CRITERIA

A. Uniform Wind Uplift Load Capacity:

1. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Attachment shall be installed exactly as given in Part 3. (To be included with bid documents)
 - a. Design Code: ASCE 7-10, Method 2 for Components and Cladding.
 - b. Risk Category III.
 - c. Wind Importance Factor of 1.0.
 - d. Wind Speed: 115 MPH.
 - e. Exposure Category: C.

2.3 ROOF INSULATION

A. Rigid polyisocyanurate board, with a strong white or black fibrous glass facer conforming to or exceeding the requirements of ASTM C 1289 / FS HH-I-1972. EnergyGuard™ Polyiso Insulation, with the following characteristics:

1. Board Thickness: As indicated. Available in a variety of thicknesses, from 1/2-inch to 4.6 inches.
2. Thermal Resistance (LTTR value) of: R5.6 per inch.

B. Tapered rigid polyisocyanurate board, with a strong white or black fibrous glass facer conforming to or exceeding the requirements of ASTM C 1289 / FS HH-I-1972. EnergyGuard™ Tapered Polyiso Insulation, with the following characteristics:

1. Board Thickness: Tapered.
2. Thermal Resistance (LTTR value) of: Varies.

2.4 SUBSTRATE BOARD (ROOF COVER BOARD)

A. Dens Deck Prime, as manufactured by Georgia-Pacific; www.georgiapacific.com

1. 1/2" thickness.
2. Width: 4 feet.
3. Length: 8 feet.
4. Surfacing: Fiberglass mat with non-asphaltic coating.

2.5 MEMBRANE ROOFING

A. Materials: Insulation, modified base sheet, and modified capsheet membrane and surfacing.

1. Base Ply: The smooth surfaced modified membrane will be: Stressbase 80, SBS modified base sheet.
2. Modified Membrane: Stressply Plus FR Mineral. Dual reinforced, fire resistant, SBS modified bitumen.

3. Base flashing base ply: HPR Tribase.
4. Flashing capsheet: 135 mil mineral surfaced modified membrane.

2.6 MODIFIED BITUMEN MEMBRANE PERFORMANCE REQUIREMENTS

- A. Tensile Strength, ASTM D 5147
 1. 2 in/min. @ 73.4 ± 3.6 °F MD 200 lbf/in XD 200 lbf/in
- B. Tear Strength, ASTM D 5147
 1. 2 in/min. @ 73.4 ± 3.6 °F MD 300 lbf XD 300 lbf
- C. Elongation at Maximum Tensile, ASTM D 5147
 1. 2 in/min. @ 73.4 ± 3.6 °F MD 3.5% XD 3.5%
- D. Low Temperature Flexibility, ASTM D 5147, Passes -30 degrees F (-34)

2.7 BITUMINOUS MATERIALS

- A. Primer: V.O.C. compliant, ASTM D-41.
- B. Asphalt Roofing Mastic: V.O.C. compliant, Silver Flash, ASTM D-2822, Type II.
- C. Asphalt: ASTM D312, Type IV. Trumbul Tru-Lo Max or equal.

2.8 RELATED MATERIALS

- A. Caulking and sealant: Tuff-Stuff urethane caulking.
- B. WalkPads: APOC, 1/2" min.
- C. Zinc drain pans and pipe flashing: ASTM B69, 99.95% pure zinc. Zincjak: Commercial Innovations, www.commercialinnovations.com.
 1. Thickness: 0.02".
 2. Pipe flashing: interior coated.
 3. Drain pans: pretreated both sides with factory primer topside coating.
 4. Lead free solder for zinc: SN 100C, Aim Solder, <http://www.aimsolder.com>.
 5. Flux for zinc: #17 or #70, Superior Flux Mfg. Co., www.superiorflux.com.

2.9 SURFACING

- A. White Elastomeric Roof Coating: Pyramic; Energy Star approved white acrylic roof coating as indicated on drawings:
 1. Reflectance 81%.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.
- B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.
- C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work.
- D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets with two (2) plies of #15 organic felt set in mastic and with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work.
- E. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- F. Apply roofing materials as specified herein unless recommended otherwise by manufacturer's instructions. Keep roofing materials dry before and during application. Do not permit phased construction. Complete application of roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day.

3.3 INSULATION ATTACHMENT

- A. General:
 - 1. Mechanically attach base layers of insulation with screws and plates per manufacturer's wind uplift calculation.
 - 2. Install cover board insulation in hot asphalt.
- B. Install roof insulation in not less than 2 layers with joints of each succeeding layer parallel and offset in both directions with respect to the layer below.
- C. Install only as much insulation as can be completely covered with roofing on the same day. At the end of each days work, seal the edges of the insulation with 18-inch wide strips of felt adhered with either hot asphalt or plastic roof cement to both the deck and the completed roof membrane. Remove these strips before continuing application of insulation.
- D. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows (for 48" x 48" boards); end joints staggered not less than 12 inches in adjacent rows (for 48" x 96" boards); and with long joints continuous at right angle to flutes of decking (for 48" x 96" boards).
 - a. Locate end joints over crests of decking.

- b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 1) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - f. Trim insulation, so that water flow is unrestricted.
 - g. Fill gaps exceeding 1/4 inch with insulation.
 - h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

E. Installation Over Concrete Decks:

- 1. Allow structural deck to cure a minimum of 28 days.
- 2. Prime deck at 1 gal. per sq.
- 3. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows (for 48" x 48" boards); end joints staggered not less than 12 inches in adjacent rows (for 48" x 96" boards).
 - a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - c. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches (600 mm).
 - 1) Trim insulation, so that water flow is unrestricted.
 - d. Fill gaps exceeding 1/4 inch with insulation.
 - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - f. Adhere base layer of insulation directly to concrete roof deck in a mopping of hot asphalt applied at the rate of 25-pounds per 100-square feet, applied within plus or minus 25 deg F of equiviscous temperature.

4. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Set each layer of insulation in a mopping of hot asphalt applied at the rate of 25-pounds per 100-square feet, applied within plus or minus 25 deg F of equiviscous temperature.

3.4 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board, so that water flow is unrestricted.
 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 4. Install cover board in full mopping of hot asphalt.

3.5 BASE PLY INSTALLATION

- A. Base ply: Install base ply shingled uniformly to achieve one ply throughout over the prepared substrate. Shingle in proper direction to shed water on each area of roof.
- B. Stagger end laps twelve inches minimum.
- C. Extend ply two inches beyond top edges of cants at wall and projection bases.
- D. Install base flashing ply to all perimeter and projections details.

3.6 MODIFIED MEMBRANE APPLICATION

- A. Starting at the low point, apply StressPly Plus FR Mineral in hot asphalt in the desired position.
- B. Care should be taken to eliminate air entrapment under the membrane.
- C. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.
- D. Subsequent rolls of modified shall be installed across the roof as above with a minimum of 4" side laps and 8" end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayers, but the laps shall not coincide with the laps of the base layers. Adhere all end laps with mastic.

- E. Extend membrane 2" beyond top edge of all cants in full moppings of the specified asphalt as shown on the drawings.
- F. Seal top of membrane at end of each day.
- G. Base and should be installed same day.

3.7 FLASHING MEMBRANE APPLICATION (GENERAL)

- A. All curb, wall and parapet flashings shall be sealed with an application of mastic and mesh on a daily basis. No condition should exist that will permit moisture entering behind, around, or under the roof or flashing membrane.
- B. Prepare all walls, penetrations and expansion joints to be flashed and where shown on the drawings, with asphalt primer at the rate of one gallon per 100 square feet Allow primer to dry tack free.
- C. The modified membrane will be used as the flashing membrane and will be adhered to an underlying base flashing ply and nailed off 8" O.C. at all vertical surfaces. Over 12" the modified membrane will be 80 mils with a mineral cap sheet installed over the top.
- D. The entire sheet of flashing membrane must be solidly adhered to the substrate.
- E. Seal all vertical laps of flashing membrane with a three course application of Flashing Bond and fiberglass mesh.
- F. Counter flashing, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other sections.
- G. Roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with modified bituminous roof system work are in other sections.
- H. Ensure all flashing are nailed off and sealed with a three course application of mastic and mesh.

3.8 APPLICATION OF SURFACING

- A. Prior to installation of surface, obtain approval from manufacturer as to work completed.
- B. Apply Pyramic at 1.5 gallons per sq. per coat. Apply two coats.

3.9 CLEANING

- A. Remove drippage of bitumen from all walls, windows, floors, ladders, and finished surfaces.
- B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3.10 FINAL INSPECTION

- A. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with the performance of the roofing system.
- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party attending.
- C. The Roofing System Manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor at a negotiated price.
- D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.
- E. Repair or replace (as required) deteriorated or defective work found at time above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- F. The Contractor is to notify the Owner upon completion of corrections.
- G. Following the final inspection, acceptance will be made in writing by the material manufacturer.

END OF SECTION

09/21/18

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed wall-to-roof expansion joint sheet metal fabrications.
6. Formed equipment support flashing.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 41 13.16 "Standing Seam Metal Roof Panels" for pre-finished sheet metal gutters, flashing and trim integral with roofing.
3. Section 07 42 13.13 "Formed Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
4. Section 07 42 13.23 "Aluminum Composite Panels" for sheet metal flashing and trim integral with aluminum composite panels.
5. Section 07 42 93 "Soffit Panels" for sheet metal flashing and trim integral with soffit panels.
6. Section 07 95 13.13 "Interior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.
7. Section 07 95 13.16 "Exterior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.

1.2 REFERENCES

A. The editions of standards and specifications published by the following organizations, and referenced herein, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International
National Roofing Contractors Association (NRCA)
Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
U.S. General Services Administration Federal Specifications (FS)

1.3 COORDINATION

- ###### A. Secure field measurements required for proper and adequate fabrication and installation of the work.
- ###### B. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

- C. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Attendees: Owner, Architect, Contractor, IOR, representatives of the applicators and materials manufacturers of the insulation and modified bituminous membrane roofing and standing seam metal roofing systems, the sheet metal installer, and the roofing accessories installer.
 - 2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 4. Review requirements for insurance and certificates if applicable.
 - 5. Review sheet metal flashing observation and repair procedures after flashing installation.
 - 6. The conference shall assure a clear understanding of the drawings and specifications, resolve possible conflicts and establish coordination between all parties involved.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of roof-penetration flashing.
 - 8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 9. Include details of gutters, downspouts, and scuppers.
 - 10. Include details of special conditions.
 - 11. Include details of connections to adjoining work.
 - 12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches
- C. Samples: For each type of sheet metal and accessory indicated with factory-applied finishes.
 - 1. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.
- C. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction or ICC-ES showing compliance with ANSI/SPRI/FM 4435/ES-1.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- B. Special warranty.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 - 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including gutter, fascia, fascia trim, apron flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 - 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 - 2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. As-Milled Finish: Mill.
 - 2. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 316 and Type 316L as designated, dead soft, fully annealed; with smooth, flat surface.

1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled) or as indicated.
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- E. Galvanized Sheet Metal: Galvanized iron or steel sheet, ASTM A653, with minimum zinc coating of 1.25 ounces per square foot and 0.2 percent copper bearing.
- F. Factory Finished Sheet Metal: Pre-finished sheet metal to match metal roofing is specified in Section 07 41 13.16. The material shall be furnished by the roofing manufacturer and fabricated and installed as work under this Section.
- G. Lead Sheet: ASTM B749 lead sheet.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GCP Applied Technologies Inc.
 - b. Henry Company.
 - c. Polyken Technologies/Kendall Co.; Polyken 626 Foilastic
 - d. Protecto Wrap Company.; Protecto Seal 45.
 2. Source Limitations: Obtain underlayment from single source from single manufacturer.
 3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.
- B. Slip Sheet: Rosin-sized building paper, 5-pound sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation

and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
2. Nails: Use case-hardened concrete nails over concrete and roofing nails over wood, of required lengths. Where sheet metal is built in over roofing materials or other sheet metal, use nails with 1 inch tinned discs.
3. Rivets: Tinned soft iron rivets.
4. Sheet Metal Screws: Self-tapping type, of proper size and material to suit conditions. Where wood nailers are provided, use galvanized or stainless steel wood screws as applicable.
5. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
6. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
7. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

- C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60 or Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
2. For Zinc-Coated (Galvanized Steel): ASTM B32, 95-5 tin/antimony solder, with rosin flux.

- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- F. Butyl Sealant: Where it is impractical to use a solder at joints and corners, seal with a butyl sealant. ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement. Acceptable products or equal:

Garland Butyl Sealant
Tremco; Butyl Sealant

- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

- H. Modified Bitumen Flashing Cement: Two-component elastomeric compound. Acceptable products or equal:

Johns Manville; MBR Flashing Cement Base
Celotex Roofing Products Division; SBS Modified Flashing Adhesive

- I. Non-Shrink Grout: Premixed, nonmetallic, non-corrosive, non-staining grouting compound containing silica sands, portland cement, shrinkage compensating agents and water reducing agents, meeting the requirements of ASTM C1107. Acceptable products or equal:

Gifford Hill & Co., Inc.; Supreme
Master Builders; Masterflow 713
The Upco Company; Upcon Nonshrink

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated, with factory-mitered and -welded corners and junctions, and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Basis-of-Design Products: Subject to compliance with requirements, provide Springlock Flashing System products from Fry Reglet Corp., or comparable products by one of the following:

W.P. Hickman Company
Substitutions: Section 01 25 13 – Product Options and Substitutions.

2. Material: Galvanized steel, 0.022 inch thick; or 0.025 inch extruded aluminum.
3. Surface-Mounted Type: Fry Reglet Type “SM”. Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Stucco Type: Fry Reglet Type “ST” and Type “STX”. Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
5. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
6. Finish: Mill.

2.6 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
 1. Seams for metals being soldered: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 2. Seams for aluminum sheet and metals with painted finishes: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 3. Seams for aluminum sheet without painted or coated finish: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.
- I. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by fabricator.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters:
 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
 2. Fabricate in minimum 96-inch long sections.
 3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
 4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 5. Gutter Profile: As shown on drawings.
 6. Lap joints between sections 1-1/2 inches, rivet and solder.
 7. Expansion Joints: Butt type with cover plate. Provide loose locked expansion joints midway between outlet tubes to provide for 1-1/2 inch movement in both directions.

5. Provide expansion joints with cover strips in a manner to provide free movement and watertight connection. Fabricate expansion joint cover strips of 22 gauge stainless steel, Type 316.
 7. Flange the upper end of tubes and rivet and solder to the lining.
 8. Extend tubes into downspouts at least 2-inches.
 9. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
 11. Gutters with Girth 26 to 30 Inches: Fabricate from following material:
 - a. Aluminum: 0.063 inch thick.
 12. Support gutters with 2" wide gutter brackets at 24 inches on center maximum.
- B. Downspouts: Where designated, provide steel pipe downspouts per Section 05 50 00 – Metal Fabrications.
- C. Downspouts: Where designated, fabricate round downspouts to dimensions indicated, complete with mitered elbows. Furnish with steel bracket assembly as detailed. Shop fabricate elbows.
1. Fabricated Hanger/Bracket Style: As detailed.
 2. Fabricate downspouts from the following material:
 - a. Galvanized Steel: 0.1382 inch (10 gauge).
- D. Splash Pans: Fabricate to dimensions and shape required and from the following material:
1. 16-gauge pre-finished galvanized sheet metal.
 2. Form splash pans in accordance with Plate 36 of the SMACNA Manual including recommended dimensions, unless otherwise indicated. Form pans with corrugated or ribbed bottoms.
 - a. Back height: 4 inches.
 - b. Back width: 4 inches greater than downspout.
 - c. Sides; Tapered from 4 inch to 1 inch.
 - d. Front Width: 18 inches.
 - e. Length: 30 inches.
 - f. Downspout elbow to terminate approximately 1 inch above back of splash pan.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing and Fascia Cap: Fabricate in minimum 96-inch long, but not exceeding 12-foot long sections. Furnish with 6-inch wide, joint cover plates. Shop fabricate interior and exterior corners.
1. Joint Style: Butted with expansion space and 6-inch wide, exposed cover plate.
 2. Seal laps with butyl sealant.
 3. Fold back exposed edges of roof edge flashing 1/2-inch on the underside.
 4. Place roof edge flashing on roofs after roof membrane layer has been laid.
 5. Place in position on a 1/8-inch thick bed of black plastic cement the full width of the flange and fasten as indicated not to exceed 12-inches on center.
 6. Fabricate from the Following Materials:
 - a. Pre-finished Galvanized Steel: 0.028 inch (24 gauge) thick.
- B. Copings: Fabricate in minimum 96-inch long, but not exceeding 12-foot long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal or solder or weld watertight. Shop fabricate interior and exterior corners.
1. Coping Profile: As detailed, in accordance with SMACNA's "Architectural Sheet Metal Manual."

2. Joint Style: Butted with expansion space and 6-inch wide, concealed backup plate.
3. Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch (24 gauge) thick.
- C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 1. Stainless Steel: 0.031 inch (22 gauge) thick.
 2. Stainless Steel: 0.038 inch (20 gauge) thick.
 3. Galvanized Steel: 0.028 inch (24 gauge) thick.
- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 1. Stainless Steel, Type 316: 0.031 inch (22 gauge) thick.
 2. Galvanized Steel: 0.028 inch thick.
- E. Flashing Receivers: Fabricate from the following materials:
 1. Stainless Steel: 0.050 inch (18 gauge) thick.

2.9 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.
 2. Aluminum Sill Pan/End Dam Flashing: 0.032 inch thick.
 3. Aluminum Brake Metal Flashing at Storefront Jambs: 0.080 inch thick.

2.10 WALL-TO-ROOF EXPANSION JOINT SHEET METAL FABRICATIONS

- A. Wall-to-Roof Expansion Joint Cover: Fabricate from the following materials:
 1. Expansion Joint Cover: Stainless Steel, Type 316: 0.038 inch (20 gauge) thick.
 2. Bent Galvanized Steel Clip: 1/8" Galvanized Steel Plate.
 3. Metal Counterflashing: Stainless Steel, 0.031 inch (22 gauge) thick.

2.11 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.052 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Check base flashings to ensure that they extend at least 9 inches above the toe of cant and are securely fastened to the structure.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment:
1. Install self-adhering sheet underlayment, wrinkle free.
 2. Prime substrate if recommended by underlayment manufacturer.
 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
 5. Overlap side edges not less than 3-1/2 inches.
 6. Roll laps and edges with roller.
 7. Cover underlayment within 14 days.
- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
1. Install in shingle fashion to shed water.
 2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws and for other substrates not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
 2. Do not use torches for soldering.
 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 4. Stainless-Steel soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
1. Join sections with riveted and soldered joints.
 2. Provide for thermal expansion.
 3. Attach gutters at eave or fascia to firmly anchor them in position.
 4. Provide end closures and seal watertight with sealant.

5. Slope to downspouts.
 6. Fasten gutter spacers to front and back of gutter.
 7. Anchor back of gutter that extends onto roof deck with fasteners spaced not more than 24 inches apart.
 8. Anchor gutter with gutter brackets spaced not more than 24 inches apart; and gutter spacers at 16 inches on center. Fasten back of gutter spacer to roof deck fascia, and rivet front end of gutter spacer to front gutter bead.
 9. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
 10. Install continuous gutter screens on gutters with noncorrosive fasteners, hinged to swing open, for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers as detailed with fasteners designed to hold downspouts securely to walls and columns. Locate hangers at top and bottom and at approximately 60 inches on center.
 2. Where shown, provide elbows at base of downspout to direct water away from building.
- D. Splash Pans:
1. Install where downspouts discharge on low-slope roofs.
 2. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.
- E. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.

3.5 INSTALLATION OF ROOF FLASHING

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing:
1. Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
 2. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings:
1. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
 - a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
 - b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Reglets and Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches.
 - 4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHING

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous sheet metal head flashing assembly at door frames and similar openings to extend 4 inches (or as shown on drawings beyond wall openings at jamb).

3.7 INSTALLATION OF MISCELLANEOUS FLASHING

- A. Equipment Support Flashing:
 - 1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
 - 2. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Flashing at Roof Penetrations:
 - 1. Provide metal flashing for all pipes, ducts, conduits, equipment supports, and vent stacks projecting through the roof surface as indicated and required.
 - 2. Refer to Section 07 41 13.16 for flashing material and insulation at Standing Seam Metal Roof Panels.
 - 3. Refer to Section 07 52 00 for flashing material and installation at Modified Bituminous Membrane Roofing.
- C. Miscellaneous Flashings and Metal Trim: Miscellaneous flashings, metal trim, and their related components are not necessarily individually described. Furnish miscellaneous items and trim not mentioned or described in accordance with the intent of the drawings and specifications and as required to complete the work.

3.8 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.10 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

3.11 SHOP PAINTING

- A. Treat sheet metal surfaces which will be concealed in the finished work with an approved acid wash and then shop paint with one coat of an approved galvanized primer such as zinc dust-zinc oxide primer. Unfinished sheet metal surfaces that will be exposed in the finished work are specified to be treated and prime-painted under Section 09 91 00.

END OF SECTION

09/21/18

SECTION 07 72 33

ROOF HATCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Factory-fabricated roof access hatches for ladder access.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Work:
 - 1. Section 05 51 33 "Metal Ladders" for ladder access and ladder safety device.
 - 2. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing."

1.2 REFERENCES

- A. The editions of ASTM International standards referenced herein apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

1.3 COORDINATION

- A. Coordinate layout and installation of roof hatches with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's standard technical product data, rough-in diagrams, details, installation instructions and general product information. Data shall show thickness, type, grade, and class of materials; dimensions; details of construction and installation details.
- B. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.
- C. Installation Instructions: Submit manufacturer's instructions for installation of roof hatch assemblies.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof hatches, to include in operation and maintenance manuals.
- B. Warranty: Submit executed copy of manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer: A minimum of 5 years experience manufacturing similar products.
- B. Installer: A minimum of 2 years experience installing similar products.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Assemblies shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness and wet storage stains upon delivery to the job site.
- B. Storage and Handling: Do not uncrate assemblies until they are ready for use. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

1.8 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of Substantial Completion. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design Manufacturer: Type S-50 Roof Hatch by The Bilco Company, P.O. Box 1203, New Haven, CT 06505, 1-800-366-6530, Fax: 1-203-933-8478, Web: www.bilco.com. Acceptable products include:

Babcock-Davis Hatchways, Inc.; www.babcock-davis.com; Model 6-104
Dur-Red Products; www.dur-red.com; Model LH-A
Substitutions: Section 01 25 13 "Product Options and Substitution."

2.2 ROOF HATCHES

- A. Furnish and install where indicated on drawings metal roof hatch Type S-50, size width: 36" x length: 30". Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Cover: Reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span and a 140 psf wind uplift for galvanized steel (Type S-50).
 - 2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - 3. Operation of the cover shall not be affected by temperature.
 - 4. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
 - 5. Aluminum (Type S-50) roof hatches shall be Miami-Dade Product approved (NOA No. 14-0708.07 Expiration Date: December 2, 2019), meeting large and small missile impact requirements. Florida Product Approval #FL15110.

- C. Cover: Shall be 11 gauge (2.3mm) aluminum with a 3" beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- D. Cover insulation: Fiberglass of 1" thickness, fully covered and protected by a metal liner of 18 gauge (1mm) aluminum.
- E. Curb: 12" in height and of 18 gauge (1mm) aluminum. The curb shall be formed with a 3-1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6" on center, to be bent inward to hold single ply roofing membrane securely in place.
- F. Curb insulation: Rigid, high-density fiberboard of 1" thickness on outside of curb.
- G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe; welded to the curb assembly.
- H. Hardware:
 - 1. Heavy pintle hinges.
 - 2. Cover shall be equipped with a spring latch with interior and exterior turn handles.
 - 3. Roof hatch shall be equipped with interior and exterior padlock hasps.
 - 4. The latch strike shall be a stamped component bolted to the curb assembly.
 - 5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
 - 6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.
 - 7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.
- I. Factory finish: Mill finish aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates, and with roof insulation, roofing and flashings. Anchor units securely to supporting structural substrates.
- B. Roof Hatches: Install roof hatches in accordance with the manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work. Attach flanges to wood decking or nailers with minimum 3/8-inch diameter lag screws.

1. Isolation: Where metal surfaces of units are to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces.
2. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

3.3 CLEANING AND ADJUSTING

- A. Operational Units: Test and operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.
- B. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION

08/27/18

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-rated construction, and in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system

manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products; www.3m.com/firestop
 - b. Hilti, Inc.; www.hilti.com
 - c. The RectorSeal Corporation; www.rectorseal.com
 - d. Specified Technologies, Inc.; www.stifirestop.com
 - e. Tremco, Inc.; www.tremcosealants.com
 - f. U.S. Gypsum Company; www.usg.com
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-

retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
- K. 3M Fire Barrier CP25WB+ Sealant: High-performance, intumescent, water-based sealant. No-sag, fast drying, paintable, red in color. Versatile firestop sealant for pipes (not for use with CPVC), cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.
 - 1. Fire Resistance: For use in 1, 2, 3 or 4 hour fire-rated systems.
 - 2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
 - 3. STC rating of 54 when tested in STC 54-rated wall assembly.
- L. 3M Fire Barrier Water Tight Sealant 3000 WT: Single-part, water-tight, intumescent silicone firestop sealant for filling voids in concrete gypsum, metal, plastic, wood and insulation. Light gray color with black flecks. Meets UL Water Leakage Test, W Rating – Class 1 requirements.
 - 1. Fire Resistance: For use in 1, 2, 3 or 4 hour fire-rated systems.
 - 2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
 - 3. STC rating of 53 when tested in STC 54-rated wall assembly.
- M. 3M Fire Barrier Moldable Putty+: One-part, 100 percent solids intumescent firestop. Remains pliable, flexible and easily re-enterable. Non-toxic synthetic formula. Versatile putty for pipes, cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.
 - 1. Type: Stick or Pad.
 - 2. Fire Resistance: For use in 1, 2 or 3 hour fire-rated systems.
 - 3. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under "Firestop Systems."
- C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."
- D. Penetration Firestopping System for Metallic Pipes, Conduit, or Tubing:
 1. UL-Classified Systems: W-L-1001.
 2. F Ratings: 1, 2, 3 and 4 Hr.
 3. T Ratings: 0, 1, 2, 3, and 4 Hr.
 4. L Rating At Ambient: Less than 1 CFM/sq ft.
 5. L Rating At 400 Deg F: Less than 1 CFM/sq ft.
 6. Type of Fill Material: 3M Company, Fire Barrier CP 25WB+ Sealant, or FB-3000 WT Sealant.
- E. Penetration Firestopping System for Metal Ducts:
 1. UL-Classified Systems: W-L-7008.
 2. F Rating: 1 & 2 Hr.

3. T Ratings: 0 Hr.
4. Type of Fill Material: 3M Company, Fire Barrier CP 25WB+ Sealant.

END OF SECTION

08/27/18

SECTION 07 84 43
JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."

2.2 FIRESTOPPING, GENERAL

- A. Provide fire-resistive joint system products that are compatible with one another, with the substrates forming openings, under conditions of service and application, as demonstrated by fire-resistive joint system product manufacturer based on testing and field experience.
- B. Provide components for each fire-resistive joint system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.3 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.

- c. Nelson Firestop; a brand of Emerson Industrial Automation.
 - d. RectorSeal.
 - e. Roxul Inc.
 - f. Specified Technologies, Inc.
 - g. Thermafiber, Inc.; an Owens Corning company.
 - h. Tremco, Inc.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Nelson Firestop; a brand of Emerson Industrial Automation.
 - d. RectorSeal.
 - e. Roxul Inc.
 - f. Specified Technologies, Inc.
 - g. Thermafiber, Inc.; an Owens Corning company.
 - h. Tremco, Inc.
 - 2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

2.4 MATERIALS

- A. General: Use only fire-resistive joint system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, linear void width, movement capabilities, and fire-rating involved for each separate instance.
- B. Elastomeric Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture and accommodate minimum ± 25 percent movement, the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) SpecSeal Series AS Elastomeric Spray.
 - 2. Specified Technologies, Inc. (STI) SpecSeal Series ES Elastomeric Sealant.
- C. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag), the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) SpecSeal SIL300 Silicone Firestop Sealant
- D. Intumescent Sealants: Single component intumescent latex formulations containing no water soluble intumescent ingredients capable of expanding a minimum 8 times, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series LCI Intumescent Sealant

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Joint Firestopping System Schedule: TBD.

END OF SECTION

08/27/18

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Sealant work, except as otherwise specified, required to weatherproof the buildings, and including interior sealant work. This section contains requirements pertaining to all weather and interior sealant work throughout the project and becomes a part of each and every section calling for sealant and calking, unless otherwise specified, as though written in full in each section.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 07 84 43 "Joint Firestopping" for sealants for joint firestopping systems.
 - 2. Section 08 80 00 "Glazing" for sealants for glazing work.
 - 3. Section 09 29 00 "Gypsum Board" for sealing perimeter systems.

1.2 REFERENCES

- A. The editions of ASTM International Standards referenced herein apply to the work only to the extent specified by the reference thereto. Refer to Section 01 42 19 for information concerning availability and use of references.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint sealant product. Submit copies of manufacturer's specifications, recommendations and installation instructions for each type of sealant and related material required.
- B. Samples: Submit samples indicating the color range available for each sealant material intended for installation in locations exposed to view. Materials installed before approval of color will be subject to removal and replacement with approved material.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

1. Include manufacturer's letter of certification, or certified test reports indicating that each material complies with the requirements specified herein and is suitable for the applications indicated.
2. Include manufacturer's letter of certification indicating that sealants, primers and cleaners comply with regulations controlling use of volatile organic compounds.

B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Obtain joint sealants from a single manufacturer for each different product required. Obtain elastomeric sealants only from manufacturers who will, if required by the Architect, send a qualified technical representative to the Project site to advise the installer of proper procedures and precautions for the use of these materials.
- B. Installer's Qualifications: Employ a firm having a minimum of 5 years successful experience in the application of the types of materials required.
- C. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in sealants, primers and cleaners shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealants to the Project site in unopened containers, labeled with the manufacturer's name, brand designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi component materials.
- B. Store sealants in an area where they will not be subject to temperatures above 100 degrees F or below 40 degrees F. Do not store materials that have exceeded the manufacturer's recommended shelf life.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

- C. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

Verify available warranties and warranty periods for joint sealants.

1. Warranty Period: Five years from date of Substantial Completion.
- D. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
- E. Warrant work under this section against moisture penetration for a period of 5 years from the date of "Substantial Completion". The written warranty shall include materials and labor required to repair leaks that develop. The warranty shall be signed by the sealant manufacturer, the sealant installer and the Contractor.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SEALANT MATERIALS

- A. Type A Sealant: Multiple component, self-leveling polyurethane based sealant meeting the requirements of ASTM C920, Type M, Grade P, Class 25. Acceptable products or equal:
- Pecora Corp.; Urexpam NR-200
Sika Corp.; Sikaflex-2c-SL
Sonneborn Building Products; Sonolastic SL 2
Tremco, Inc.; Vulkem 445 SSL
- B. Type B Sealant: Single or multiple component, nonsag polyurethane based sealant meeting the requirements of ASTM C920, Type S or M, Grade NS, Class 25. Do not use single component sealants when excessive movement is expected within the curing time of the sealant. Acceptable products or equal:
- BASF MasterSeal NP 1 or NP 2
Pecora Corp.; Dynatrol I or II
Sika Corp; Sikaflex 1a or 2c-NS Ez-Mix
Tremco; Dymonic FC or Dymeric 240 FC

- C. Type C Sealant: Butyl rubber based sealant meeting the requirements of ASTM C920, Type S, Grade NS, Class 7.5. Acceptable products or equal:
- Adco Seal; No. B-100
Pecora Corp.; BC-158
PTI Sealants; PTI 757
Tremco; Butyl Sealant
- D. Type D Sealant: Latex acrylic based sealant meeting the requirements of ASTM C834. Acceptable products or equal:
- Pecora Corp.; AC-20
Sonneborn Building Products; Sonolac
Tremco; Acrylic Latex 834
- E. Type E Sealant: Medium modulus silicone sealant meeting the requirements of ASTM C920, Type S, Grade NS, Class 50. Acceptable products or equal:
- Dow Corning Corp.; No. 795
Momentive; Silpruf SCS 2000
Sika Corp; SikaSil 295
Tremco, Inc.; Spectrem 2
- F. Type F Sealant: Narrow joint seam sealant meeting the requirements of AAMA 803.3-1976 and formulated for sealing joints 3/16-inch or smaller in width. Acceptable product or equal:
- PTI Sealants; PTI 200
- G. Type G Sealant: Multiple component, nonsag polysulfide or polyurethane based sealant meeting the requirements of ASTM C920, Type M, Grade NS, Class 25, Use I, recommended by the manufacturer for continuously submerged joints. Acceptable products or equal:
- L.M. Scofield Co.; Lithoseal Watercalk-3G
Sika Corp.; Sikaflex 2c NS Ez-Mix
Tremco, Inc. Dymeric 240 FC
- H. Acoustical Sealant: Sealant shall be one of the following types at the Contractor's option:
1. Polyvinyl chloride foam tape with pressure sensitive tape on one side 3/4-inch wide by the thickness required to accommodate unevenness of substrates and completely fill openings between partition framing and building floors and concrete or masonry wall. Acceptable products or equal:
- Norton Co.; Norseal V730 Series
Arlon; Series 6A
2. Permanently resilient compound manufactured specifically for acoustical applications. Acceptable products or equal:
- Ohio Sealants; Sound Calk (solvent type)
Pecora Corp.; BA-98
Tremco; Acoustical Sealant

2.3 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin, or Type O (open-cell material), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Profile: Round in shape, with diameter never less than 30 percent greater than width of joint.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the joint surfaces, backing, and anchorages of units forming sealant rabbet, and the conditions under which the sealant work is to be performed for conditions that would adversely affect the performance of the sealant.
- B. Do not proceed with the sealant work until unsatisfactory conditions have been corrected. Start of sealant work constitutes acceptance of conditions.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after

cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- a. Concrete.
 - b. Unglazed surfaces of ceramic tile.
 - c. Portland-Cement Plaster.
3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 JOINT DIMENSIONS

- A. Butyl Base Type Sealant: Minimum joint width of 1/4-inch, and the depth of 3 times the width of the joint, with the maximum depth 3/4-inch.
- B. Silicone Rubber Sealant: Minimum joint width of 1/4-inch, and depth of approximately one-half the width, but in no case less than 1/4-inch. Other width-to-depth ratios as follows:

JOINT WIDTH:	JOINT DEPTH:	
<u>For Nonporous Surfaces:</u>	<u>Minimum</u>	<u>Maximum</u>
1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/2 of width	Equal to width
Over 1/2"	Not Permitted	
<u>For Porous Surfaces</u>		
1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/4"	Equal to width
1/2" to 1"	1/2"	Equal to width
Over 1"	Not Permitted	

- C. Acrylic and Polyurethane: Minimum joint width of 1/4-inch, and depth equal to width, but in no case deeper than 1/2-inch. Other width-to-depth ratios as follows:

JOINT WIDTH:	JOINT DEPTH:	
<u>For Nonporous Surfaces:</u>	<u>Minimum</u>	<u>Maximum</u>
1/4" (minimum)	1/4"	1/4"

1/4" to 1/2"	Equal to width	Equal to width
Over 1/2" to 1" maximum	1/2"	1/2"

For Porous Surfaces

1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/4"	Equal to width
1/2" to 1"	1/2"	1/2"
Over 1"	Not Permitted	

3.4 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide flush joint profile unless otherwise indicated, according to Figure 8B in ASTM C 1193. Rounded off finishing will not be allowed.
- G. Seal around all openings in exterior walls, and other locations indicated or required for waterproofing the buildings. Seal all other joints as herein specified, indicated, and required to properly complete the buildings.
- H. Apply sealants using specified materials and proper tools. Prepare surfaces (cleaning, etc.) and apply sealant as specified herein and in accordance with the manufacturer's printed instruction and recommendations.

- I. Do not use sealants when they become too jelled to be discharged in a continuous flow from the gun. Modification of sealants by addition of liquids, solvents, or powders will not be permitted.
- J. Apply sealants with guns having proper size nozzles. Use sufficient pressure to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where the use of the gun is impracticable, use suitable hand tools.
- K. Neatly point sealed joints on flush surfaces with beading tool, and internal corners with eaving tool. Remove excess material. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Complete sealing before final coats of paint are applied.

3.5 MISCELLANEOUS JOINT SEALING WORK

- A. The entire extent of sealing work is not necessarily fully or individually described herein. Provide sealing wherever required to prevent light leakage as well as moisture leakage. Refer to drawings for conditions and related parts of the work.

3.6 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.7 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.8 JOINT-SEALANT APPLICATION SCHEDULE

- A. Type A Sealant: Use for all joints in exterior and interior concrete and ceramic and quarry tile floors and paved surfaces subject to foot traffic.
- B. Type B Sealant: Use for all vertical joints in masonry, plaster, and concrete, exposed on the exterior of the building and for sealing around metal door, window and louver frames penetrating these surfaces.
- C. Type C Sealant: Use for interior wall penetrations for pipe or conduit that will be concealed by escutcheons or other trim or plates and for lap joints in sheet metal work.
- D. Type D Sealant: Use for joints, voids, and penetrations in interior surfaces exposed to view and requiring painting.
- E. Type E Sealant: Use for all joints in contact with organically coated aluminum and for joints between precast and tilt-up concrete panels.
- F. Type F Sealant: Use for all narrow joints in aluminum storefront and curtain wall framing where joints are mechanically restricted from movement.

- G. Type G Sealant: Use for joints between window frames and other materials, and at other exterior joints for which no other sealant is indicated.
- H. Acoustical Sealant: Use to seal all perimeter joints around sound retardant partitions and around electrical boxes and other penetrations in these partitions.

END OF SECTION

08/27/18

SECTION 07 95 13.13

INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes interior expansion joint cover assemblies.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
 - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each type of expansion control system indicated.
 - 1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
 - 2. For each type of expansion control system indicated, full width by 6 inches long in size.
- D. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion joint cover assembly.
 - 2. Expansion joint cover assembly location cross-referenced to Drawings.
 - 3. Nominal, minimum, and maximum joint width.
 - 4. Movement direction.
 - 5. Materials, colors, and finishes.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of typical expansion joint cover assembly as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to 2016 California Building Code (CBC) Title 24 Part 2 requirements.
- B. Expansion Joint Design Criteria:
 - 1. Type of Movement: Seismic.
 - a. Joint Movement: As indicated on Drawings.

2.3 FLOOR EXPANSION JOINT COVERS

- A. Center-Plate Floor Joint Cover: Assembly consisting of center plate that slides over metal frames fixed to sides of joint gaps.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. Balco, Inc.
 - c. Inpro Corporation.
 - 2. Basis-of-Design Product: Construction Specialties, Inc. Model SJ-400HD.
 - 3. Application: Floor-to-floor.
 - 4. Installation: Recessed.
 - 5. Attachment Method: Mechanical anchors.
 - 6. Load Capacity: Heavy duty; 2000 lbs.
 - 7. Joint Dimensions:
 - a. Nominal Joint Width: 4 inches.

- b. Minimum Opening: 2.75 inches.
 - c. Maximum Opening: 6.36 inches.
- 8. Cover-Plate Design: Plain.
- 9. Exposed Metal: Aluminum.
 - a. Finish: #3 brushed, non-slip finish.
- 10. Turnbar Material: C1075 Blue Temper Spring Steel.

2.4 WALL EXPANSION JOINT COVERS

- A. Center-Plate Wall Joint Cover: Assembly consisting of center plate that slides over gaskets in metal frames fixed to sides of joint gaps.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. Balco, Inc.
 - c. Inpro Corporation.
 - 2. Basis-of-Design Product: Construction Specialties, Inc.; Model LAF Series.
 - 3. Application: Wall-to-wall.
 - 4. Type: Vertical cover panel.
 - 5. Exposed Metal: Aluminum.
 - a. Panel Finish: Factory-applied clear epoxy primer and field-applied paint.
 - b. Frame Finish: Class II, clear anodic.
 - 6. Panels held in place with hook and loop attachment system and incorporate a secondary system comprised of a pre-tensioned shock cord.
 - 7. Covers that utilize turnbars or other similar centering devices limit lateral shear movement and are not acceptable.

2.5 MATERIALS

- A. Aluminum: ASTM B 221 Alloy 6063-T5 for extrusions; ASTM B 209 Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- C. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

2.7 ACCESSORIES

- A. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 - 2. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.

5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 6. Locate in continuous contact with adjacent surfaces.
 7. Standard-Duty Systems: Shim to level where required. Support underside of frames continuously to prevent vertical deflection when in service.
 8. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
 9. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches on center.
- C. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- D. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION

09/21/18

SECTION 07 95 13.16

EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes exterior building expansion joint cover assemblies.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 07 62 00 "Sheet Metal Flashing and Trim" for fabricated sheet metal roof-to-wall joint systems and wall-to-wall joint systems.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Architectural Manufacturers Association (AAMA)
ASTM International (ASTM)

1.3 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint.
- D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples for Initial Selection: For each type of joint system indicated.
1. Include manufacturer's color charts showing the standard range of colors and finishes available for each exposed metal and elastomeric seal material.
- D. Samples for Verification: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.
- E. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
1. Manufacturer and model number for each expansion joint cover assembly.
 2. Expansion joint cover assembly location cross-referenced to Drawings.
 3. Nominal, minimum, and maximum joint width.
 4. Movement direction.
 5. Materials, colors, and finishes.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to 2016 CBC, based on Seismic Design Loads shown on Structural Drawings.
- B. Expansion Joint Design Criteria:
 1. Type of Movement: Seismic.
 - a. Nominal Joint Width: As indicated on Drawings.

2.3 EXTERIOR EXPANSION JOINT COVERS

- A. Exterior Elastomeric-Seal Joint Cover: Assembly consisting of elastomeric seal anchored to surface-mounted frames fixed to sides of joint gap.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.
 - b. Balco, Inc.

- c. InPro Corporation (IPC).
 - d. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- 2. Basis-of-Design Product: Construction Specialties, Inc.; Model SF-400, a gasketed exterior wall cover comprised of extruded aluminum frames, a Santoprene™ primary seal and a PVC secondary seal.
- 3. Application: Wall to wall.
- 4. Installation: Recessed.
- 5. Joint Dimensions:
 - a. Nominal Width: 4 inches.
 - b. Minimum Opening: 1 inch.
 - c. Maximum Opening: 8 inches.
- 6. Exposed Metal:
 - a. Aluminum: Mill.
- 7. Seal: Preformed elastomeric membrane or extrusion.
 - a. Color: As selected by Architect from manufacturer's full range.

2.4 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

2.5 ALUMINUM FINISHES

- A. Mill finish.

2.6 ACCESSORIES

- A. Manufacturer's stainless-steel attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches on center.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

3.4 CONNECTIONS

- A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers. Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

3.5 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections.

END OF SECTION

09/21/18

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Interior standard steel frames.
 - 2. Exterior standard steel doors and frames.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 08 14 16 "Flush Wood Doors".
 - 2. Section 08 34 73.13 "Metal Sound Control Door Assemblies" for packaged, acoustically rated hollow-metal door and frame assemblies.
 - 3. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.
 - 4. Section 08 80 00 "Glass" for glazing for hollow metal doors and frames.
 - 5. Section 09 91 00 "Painting" for field applied finish.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
National Fire Protection Association (NFPA)
National Association of Architectural Metal Manufacturers (NAAMM)
Steel Door Institute (SDI)

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
- C. Coordinate work with frame opening construction, door and hardware installation.

- D. Sequence installation to accommodate required door hardware.
- E. Verify field dimensions for factory assembled frames prior to fabrication.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
- C. Templates: Secure templates from finish hardware supplier for specified hardware and mounting locations.
- D. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

- A. Provide doors and frames meeting the requirements of either SDI A250.8 or NAAMM HMMA 861 for standard sizes and designs.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic or canvas shelters that create a humidity chamber. If the wrapper on the door becomes wet, remove the wrapper immediately.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Mark or tag each door and frame with the appropriate opening identification symbol.

1.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace hollow metal doors and frames that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Acceptable manufacturers or equal:

Amweld Building Products, Inc.; www.blackmountaindoor.com
Ceco Corp.; www.cecodoor.com
Curries Company; www.curries.com; an Assa Abloy Group company.
Door Components; www.doorcomponents.com
Forderer Cornice Works; www.fordererdoors.com
Republic Builders Products Corporation; www.republicdoor.com
Steelcraft Manufacturing Co.; www.steelcraft.com
Titan Metal Products; www.titanmetalinc.com
Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.2 INTERIOR STANDARD STEEL FRAMES

- A. Construct hollow-metal frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
2. Frames:
- a. Materials: ASTM A1008, uncoated, steel sheet, minimum thickness of 16 gauge (0.053 inch).
- b. Construction: Full profile welded, grind welds smooth.
3. Exposed Finish: Prime.

2.3 EXTERIOR STANDARD HOLLOW-METAL DOORS AND FRAMES

- A. Construct hollow metal doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches.

- c. Face: ASTM A653, metallic-coated steel sheet, minimum thickness of 16 gauge (0.053 inch), with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless; and Model 3, Stile and Rail.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: Kraft-paper honeycomb.
3. Frames:
- a. Materials: ASTM A653, Metallic-coated steel sheet, minimum thickness of 14 gauge (0.067 inch), with minimum A60 coating.
 - b. Construction: Face welded, grind welds smooth.
 - c. Face Frame Dimension: 2 inches typical.
4. Exposed Finish: Prime.

2.4 STILE AND RAIL GLAZED DOORS

- A. Basis-of-Design Product: Steelcraft Manufacturing Company; A14-Series Full Glass Entrance Doors.
- B. Fabricate doors in accordance with either ANSI A250.8 or NAAMM HMMA 861 for stile and rail construction. Provide doors with nominal 7 inch wide vertical stiles, nominal 7-1/2" intermediate rail, and nominal 8" top rail and nominal 12-inch high bottom rail. Fabricate stiles and rails with corners mitered, reinforced with channels, welded, and ground smooth.
- C. Hardware preparations and reinforcements are in accordance with ANSI A250.6. Locations are in accordance with ANSI/DHI A115 unless otherwise stated.
- D. Fabricate exterior doors of 0.064-inch (16-gage) hot-dip galvanized steel.
- E. Core: Kraft-paper honeycomb.
- F. Vertical Edge Seams: Model 2, Seamless. Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges with visible edge seams, or a one piece full height 14 gauge channel. Apply a continuous bead of structural epoxy in the internal vertical connection.
- G. Hinge Preparation: As specified in paragraph 2.7.E.
- H. Top and Bottom Channel: As specified in paragraph 2.7.B.
- I. Glass Trim: Flush mounted steel trim for 1" Insulated Glass.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, suitable for performance level indicated.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor. Form floor anchors from same material as frames, minimum thickness of 0.042 inch, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.6 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 1. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
 2. Top Edge Closures: Close top edges of doors with 14 gauge inverted galvanized channel, except provide 24 gage galvanized top cap at exterior doors.

3. Bottom Edge Closures: Close bottom edges of doors with 14 gauge galvanized channel with end closures of same material as face sheets.
 4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. Compression Type: Not less than two anchors in each frame.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6, SDI A250.8, and BHMA A156.115 for preparation of hollow-metal work for hardware, except provide 8-gage minimum hinge reinforcement for exterior doors.
- F. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.

4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than **9 inches** o.c. and not more than **2 inches** o.c. from each corner.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Field Finish: Field finish painting is specified in Section 09 91 00.

2.9 GLAZING

- A. Vision Frames for Glass Lites: Provide glazed openings with not lighter than 0.040-inch (20-gage) galvanized steel vision frames, factory primed. Frames shall be nonremovable on exterior or corridor side of door. Glass and glazing materials and methods are specified in Section 08 80 00. Acceptable products, or equal:

Anemostat Door Products; www.anemostat.com; LoPro-G Metal Vision Frame

 1. Aesthetics: Tight mitered corners, beveled glass stop and low profile, provide a clean tapered look.
- B. Glazing for Door Lites: Glass and glazing materials and methods are specified in Section 08 80 00.

2.10 CLEARANCES

- A. Provide doors and frames with clearances in accordance with SDI A250.8 or NAAMM HMMA 861.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces. Solidly fill space between frames and concrete/masonry with mineral-fiber insulation.
 - 5. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches on center and not more than 2 inches on center from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION

08/27/18

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 08 12 13 "Hollow Metal Frames".
2. Section 08 71 00 "Door Hardware".
3. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
Window and Door Manufacturers Association (WDMA)
National Fire Protection Association (NFPA)
Woodwork Institute (WI)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Submit catalog cuts or other data indicating thickness, details of stile, rail and core construction of doors, louvers, type of adhesive, face veneer species and grade, and specifications for factory finishing.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples: Submit samples of wood veneers indicated or specified to receive a factory applied transparent finish, showing color range and grain of veneers. Submit factory finishes applied to actual door face materials, approximately 8" by 10". For each wood

species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finish work.

1. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificate: WI Certified Compliance Program certificates.

1.5 QUALITY ASSURANCE

A. Certification: Before delivery to the project site, issue a WI Certified Compliance Certificate indicating that the wood doors furnished fully meet requirements of the grade specified.

1. After completion issue a WI Certified Compliance Certificate for Installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Delivery: Seal all four edges of doors before shipment. Package factory finished doors individually in plastic bags or cardboard cartons. Deliver doors to the site after plaster and concrete are dry and the building has reached the average prevailing relative humidity of the locality.

C. Mark each door on top rail with opening number used on Shop Drawings. Include manufacturer's order number and date of manufacture.

D. Storage and Handling: Store doors in an area where there will be no great variation in temperature or humidity. Stack doors flat on 2" by 4" lumber laid 12-inches from ends and across the center. To protect surfaces, provide plywood or cardboard under the bottom door and over the top of the stack. Do not drag doors across one another.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

B. Furnish to the Owner a written warranty against defects in workmanship and materials including delamination in any degree, warp or twist of 1/4-inch or more in any 3'-6" by 7'-0" section of a door, telegraphing of any part of core assembly through face veneer to cause surface variation of 1/100-inch or more in a 3-inch span, defects which impair and affect performance of the door. Replacement under this warranty shall include hanging,

installation of hardware and finishing. The warranty shall be signed by the door manufacturer and the Contractor.

- C. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Acceptable manufacturers or equal:

Algoma Hardwoods, Inc.; www.algomahardwoods.com
Eggers Industries; www.eggersindustries.com
Oregon Door; www.oregondoor.com
Oshkosh Architectural Door Company; www.oshkoshdoor.com
Marshfield DoorSystems; www.marshfielddoors.com
VT Industries, Inc.; www.vtindustries.com
Substitutions: Section 01 25 13 – Product Options and Substitutions.

- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.

- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

- C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2 as required to meet WDMA Performance Duty level specified without added blocking.

- D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:

1. Grade: Custom (Grade A faces).
2. Species: Select White Maple; selected for uniform color and grain.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Exposed Vertical Edges: Manufacturer's standard, and as required by WDMA I.S. 1A-2013 for construction grade specified.

7. Core: Particleboard or Structural composite lumber.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
9. Adhesives: Type as required to meet performance criteria of WDMA T.M.-6 duty level.

B. Door Thickness: 1-3/4 inches thick unless otherwise indicated.

2.4 LITE FRAMES AND LOUVERS

- A. Metal Frames for Lite Openings: Provide glazed openings with not lighter than 0.0359-inch (20-gage) hot or cold rolled steel glazing stops. Stops shall be nonremovable on exterior or corridor side of door, custom color as selected by the Architect. Glass and glazing materials and methods are specified in Section 08 80 00. Acceptable products, or equal:

Anemostat Door Products; www.anemostat.com; LoPro-G

B. Glass and Glazing: Specified in Section 08 80 00.

- C. Louvers: Provide fixed louvers consisting of louver blades formed of not lighter than 22 gage cold rolled steel, with welded 18 gage steel frames, custom color as selected by the Architect. Acceptable product, or equal:

Anemostat Door Products; www.anemostat.com; AFDL Inverted Y Non-Vision Louver

1. Aesthetics: Tight mitered corners, no visible welds, countersunk mounting holes and corridor side of frame free of fasteners make for a clean, streamlined appearance.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

- C. Openings: Factory cut and trim openings through doors.

1. Lite Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00.
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises, or as required by the manufacturer's warranty.

- B. Factory finish doors.
- C. Use only coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: WI's "North American Architectural Woodwork Standards", System 11, catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware".
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Provide inspection of installed Work through WI's Certified Compliance Program, certifying that wood doors, including installation, comply with requirements of WI's "North American Architectural Woodwork Standards" for the specified grade.
 - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door located in an exit enclosure, each electrically controlled egress door, and each

door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

- A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door.
- B. To prevent stile failure, ensure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.
- C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

09/21/18

SECTION 08 14 33

STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior stile and rail wood doors.
2. Factory fitting stile and rail wood doors to frames and factory machining for hardware.
3. Factory finishing.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 08 11 13 – Hollow Metal Doors and Frames: Frames for stile-and-rail wood doors.
2. Section 08 71 00 – Door Hardware: Hardware for stile-and-rail wood doors.
3. Section 08 80 00 – Glazing: Glazing for stile-and-rail wood doors.

1.2 REFERENCES AND REGULATORY REQUIREMENTS

A. It is the intent of the specification that all wood doors shall comply with the standards as listed. The latest published edition of each standard applies.

B. WDMA Interior Architectural Wood Stile & Rail Doors Standard:

1. ANSI/WDMA I.S.6-A.

C. IBC – International Building Code.

D. QAI Laboratories-Listing Directory for Building Products:

E. ADA Standards for Accessible Design (Current Edition).

F. California Air Resource Board (CARB) – formaldehyde emissions standard.

G. Consumer Products Safety Commission (CPSC):

1. 16 CFR 1201 – Standard for Architectural Glazing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Details of core and edge construction, and glazing.
2. Factory-machining criteria.
3. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:

1. Door schedule indicating door location, type, size, and swing.
 2. Door elevations, dimensions and location of hardware, lite locations, and glazing thickness.
 3. Dimensions and locations of mortises and holes for hardware.
 4. Clearances and undercuts.
 5. Requirements for veneer matching.
 6. Doors to be factory finished and application requirements.
 7. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples for Selection:
1. Available standard stain colors and gloss options. Submit samples in the form of actual materials; printed brochures are not acceptable.
 2. Available molding profiles for glazed openings.
- D. Samples for Verification:
1. Each required veneer species and factory finish; corner unit showing construction and finish minimum 8 by 10 inches.
 2. Light Opening Moldings: Minimum 6 inches long, for each material, type, and finish required.
- E. Submittal procedures and quantities are specified in Section 01 33 00 – Submittals.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Performance: Provide documents showing compliance to the following WDMA attributes, validating the specified WDMA PerformanceDuty Level:
1. Adhesive Bonding Durability: WDMA TM-6
 2. Cycle Slam: WDMA TM-7
 3. Hinge Loading: WDMA TM-8
 4. Screw Holding: WDMA TM-10
 - a. Door Face.
 - b. Vertical Door Edge.
 - c. Horizontal Door Edge (applies when hardware is attached).
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS.

- A. Maintenance Data.
- B. Manufacturer warranties transferrable to Owner.
- C. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Shall be a company specializing in the manufacture of stile and rail doors with a minimum of 10 years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.

- B. Package doors individually in opaque plastic bags or cardboard cartons. Break seal on packages while at site to permit ventilation.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity levels designed for building occupants for the remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship for the life of the original installation of the door.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Interior Stile and Rail Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Masonite Architectural: 1.877.332.4484 and www.masonitearchitectural.com
- B. Basis of Design Product: Subject to compliance with requirements, provide Aspiro™ Series | Marshfield-Algoma™ wood doors by Masonite Architectural - Authentic Stile & Rail, or comparable product by one of the following:
 - 1. Algoma Hardwoods, Inc.; www.algomahardwoods.com
 - 2. Eggers Industries; www.eggersindustries.com
 - 3. [Maiman Company \(The\); www.maiman.com](http://Maiman Company (The); www.maiman.com)
 - 4. VT Industries Inc.; www.vtindustries.com
 - 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- C. Source Limitations: Obtain stile and rail wood doors from single manufacturer

2.2 MANUFACTURING STANDARDS

- A. Interior Stile and Rail Wood Doors: Window & Door Manufacturers Association publication ANSI/WDMA I.S. 6A "Industry Standard for Interior Architectural Wood Stile and Rail Doors".

2.3 MATERIALS

- A. General: Use only materials that comply with referenced standards and other requirements specified.
 - 1. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
- B. Panel Products: Any of the following unless otherwise indicated:
 - 1. Particleboard made from wood particles, with binder containing no urea-formaldehyde, complying with ANSI A208.1, Grade M-2.
 - 2. Medium-density fiberboard made from wood fiber, with binder containing no urea-formaldehyde, complying with ANSI A208.2, Grade 130.
 - 3. Hardboard complying with ANSI A135.4.
 - 4. Veneer-core plywood, made with adhesive containing no urea-formaldehyde.
- C. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

2.4 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Doors with Transparent Finish:
 - 1. WDMA Quality grade: Custom.
 - 2. WDMA Performance Level: Extra Heavy Duty.
 - 3. Panel Type: Multiple glass panels.
 - 4. Panel Arrangement: As indicated in door elevations on Drawings.
 - 5. Stiles and Rails: Veneer on structural composite lumber.
 - 6. Veneer:
 - a. White Birch; or White Maple; as selected by Architect.
 - b. Cut: Plain sliced (flat cut).
 - c. Grade: A.
 - d. Matching: Slip.
 - e. Assembly: Running.
 - 7. Glazed Panels:
 - a. Glazing Moldings: Same species as face veneer in standard profile selected by Architect.
 - b. Glass: Fully tempered 6 mm clear glass.

2.5 DOOR CORE MATERIALS

- A. Particleboard: Wood-based particleboard; ANSI A208.4, Grade LD-2 as required to meet WDMA Performance Duty level specified without added blocking.
- B. Structural Composite Lumber: WDMA T.M.10.

2.6 STILE AND RAIL WOOD DOOR FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for field fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings: Factory install glazing in doors, complying with Section 08 80 00 "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.
- 2.7 FINISHING
- A. Finish wood doors at factory that are indicated to receive transparent finish.
- B. Finish Grade: Match grade of door.
- C. Transparent: WDMA TR-8, UV-Cured Acrylated Polyester/Urethane.
1. Staining: Color selected by Architect from manufacturer's standard colors.
 2. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Reference Standards:
1. Wood Stile and Rail Doors: WDMA I.S. 6A.
- C. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- D. Factory-Fitted Doors: Align in frames for uniform vertical and top edge clearance.

- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

09/21/18

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 07 72 33 "Roof Hatches".
 - 2. Section 09 91 00 "Painting" for field painting of steel wall and ceiling access panels.
 - 3. Section 23 31 00 "Ductwork and Accessories" for heating and air-conditioning duct access doors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Provide packaging such as cardboard or other containers to protect access panels during delivery and storage.
- B. Store access panels elevated off the floor in a dry weather tight enclosure. Provide adequate ventilation to avoid condensation. If the container becomes wet remove the panel from the container immediately.

1.5 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace access doors and frames that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

- A. Manufacturers:

Cesco Products; www.cescoproducts.com
Larsen's Manufacturing Company; www.larsensmfg.com
Milcor, Inc.; www.milcorinc.com
Nystrom, Inc.; www.nystrom.com

- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

2.3 FIRE RESISTANT WALL AND CEILING ACCESS PANELS

- A. Fire Rated Wall and Ceiling Access Panels: Acceptable products or equal:

Cesco Products; Style FB
Larsen's Manufacturing Company; L-FRAP
Milcor, Inc.; 3208 Series
Nystrom, Inc.; FR Series

1. Frame and Panel Assembly: Bear the UL label for 1-1/2 hour B label, 250 degrees maximum 30 minute temperature rise.
2. Frames: 16-gage steel.
3. Panels: 20-gage steel sandwich type equipped with an automatic closing mechanism.
4. Lock Assembly: Self-latching type with key operated cylinder lock and a mechanism to release the latch bolt from the inside. Furnish 2 keys per lock and key all locks alike.
5. Hinges: Continuous type, steel with stainless steel pins.
6. Finish: Factory applied baked enamel prime coat over a protective phosphate coating; final field finish specified in Section 09 91 00.

- B. Stainless Steel Panels: Install stainless steel access panels in wall surfaces in toilet rooms. Acceptable products or equal:

Cesco Products; Style W-SS
Larsen's Manufacturing Company; L-MPSS
Milcor, Inc.; Style MS
Nystrom, Inc.; TM Series Stainless Steel

1. Frame and Panel: 16-gage stainless steel with 1-inch wide flange.
2. Hinges: Concealed spring hinges or concealed piano hinges, opening to 175 degrees.
3. Locks: Flush, key operated cylinder lock. Furnish 2 keys per lock and key all locks alike.
4. Finish: Provide stainless steel with a No. 4 satin finish.

2.4 NON-RATED WALL AND CEILING ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Concealed Flanges Mounted in Gypsum Board: Acceptable products or equal:

Cesco Products; HF Series
Larsen's Manufacturing Company; L-DWC
Milcor, Inc.; Style DW
Nystrom, Inc.; NW Series

1. Frame Material: 16-gage steel with 26-gage galvanized steel casing bead surrounding the frame or 0.060-inch extruded aluminum.
2. Door Material: 14-gage steel.
3. Hinges: Concealed spring hinges or concealed piano hinges, opening to 175 degrees.
4. Locks: Flush, key operated cylinder lock. Furnish 2 keys per lock and key all locks alike.
5. Finish: Factory applied baked enamel prime coat over a protective phosphate coating on steel; final field finish specified in Section 09 91 00.

2.5 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
- E. Frame Anchors: Same material as door face.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to

2.6 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 - 3. Provide mounting holes in frames for attachment of units to metal or wood framing.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
- E. Stainless-Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finish: No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Provide access doors and frames where indicated or where required to provide access to valves, flow indicators, dampers and air splitters concealed within walls or chases or above ceilings.
- C. Set frames accurately in position and attach securely to supports with plane of door face panels aligned with adjacent finished surfaces.
- D. Install concealed-frame access panels flush with adjacent finish surfaces.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

09/21/19

SECTION 08 33 13
COILING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manually operated coiling counter doors.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 40 00 "Cold-Formed Metal Framing" for door opening framing.
 - 2. Section 08 71 00 "Door Hardware" for masterkeyed cylinder.

1.2 ACTION SUBMITTALS

- A. Reference Section 01 33 00 "Submittal Procedures;" submit the following items:
- B. Product Data: For each type and size of coiling counter door and accessory.
- C. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- D. Include rated capacities, operating characteristics, and furnished accessories.
- E. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
- F. Include plans, elevations, sections, and mounting details.
- G. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
- H. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
- I. Show locations of controls, locking devices, and other accessories.
- J. Quality Assurance/Control Submittals:
 - 1. Provide manufacturer ISO 9001:2008 registration.
 - 2. Provide manufacturer and installer qualifications – see paragraph 1.5.A below.
 - 3. Provide manufacturer's installation instructions.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
- B. Certificate stating that installed materials comply with this specification.

1.5 QUALITY ASSURANCE

- A. Qualifications:
- B. Manufacturer Qualifications: ISO 9001:2008 registered and a minimum of five years experience in producing counter doors of the type specified
- C. Installer Qualifications: Manufacturer's approval.

1.6 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00 - Product Delivery, Storage, and Handling.
- B. Follow manufacturer's instructions.
- C. Deliver counter doors to project site wrapped in protective covering bearing the manufacturer's name and brand designation.
- D. Store counter doors in a dry location with adequate ventilation to prevent wet storage stains.
- E. Handle counter doors carefully to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

1.7 PROJECT CONDITIONS:

- A. Cooperate with various other trades in coordinating their work required in conjunction with work under this section.
- B. Before fabrication, verify measurements at project site to insure proper fit.

1.8 WARRANTY

- A. Standard Warranty: Two years from date of Substantial Completion against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

2.2 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.

1. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide Model ESC10 by the Cookson Company, Telephone: (800) 294-4358; www.cooksondoor.com; or comparable product by one of the following:
2. Cornell; www.cornelliron.com
3. Overhead Door Corp; www.overheaddoor.com

B. Substitutions: Section 01 25 13 "Product Options and Substitutions."

2.3 MATERIALS

A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Stainless Steel Door Curtain Slat Configuration:
 - a. Stainless Steel: No. 1F, interlocked flat-faced slats, 1-1/2 inches high by 1/2 inch deep, minimum 22 gauge AISI type 304 #4 finish stainless steel with stainless steel angle bottom bar with lift handles and vinyl astragal.
2. Finish: Stainless Steel: Type 304 #4 finish.

B. Endlocks: Fabricate interlocking slat sections with high strength molded nylon endlocks riveted to ends of alternate slats

C. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

1. Fabrication:
 - a. Stainless Steel: 12 gauge formed shapes.
2. Finish: Stainless Steel: Type 304 #4 finish.

D. Hoods:

1. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
2. Hood: Minimum 24 gauge stainless steel with reinforced top and bottom edges. Provide minimum 1/4 inch steel intermediate support brackets.
 - a. Shape: Square.
 - b. Mounting: Between jambs.
 - c. Finish: Stainless steel: Type 304 #4 finish.

E. Shaft Assembly:

1. Counterbalance Shaft Assembly:
 - a. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.
 - b. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.

- F. Brackets: Fabricate from reinforced steel plate with bearings at rotating support points to support counterbalance shaft assembly and form end closures
 - 1. Finish: Standard (Stock Colors): Zirconium treatment followed by a gray, tan, or white baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness. Color as selected by Architect.

2.4 OPERATION

- A. Manual Operation:
 - 1. Push-Up: Manual lift or pole with hook.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf.

2.5 CURTAIN ACCESSORIES

- A. Push/Pull Handles: Equip each push-up-operated door with lifting handles on each side of door, finished to match door.
- B. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches high.

2.6 COUNTER DOOR ACCESSORIES

- A. Locking Device Assembly: Fabricate with cylinder lock, operable from interior (Student Store) side of bottom bar.
 - 1. Lock Cylinders: As specified in Section 08 71 00 "Door Hardware", and masterkeyed to building keying system.
 - 2. Schlage masterkeyable cylinder lock: Operable from interior (Student Store) side of bottom bar.
- B. Countertop: Stainless steel 14 gauge type 304 #4 finish: Rectangular shape design for between jambs mounted unit of size and configuration for opening size and wall construction.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. Install coiling counter door and operating equipment with necessary hardware, anchors, inserts, hangers and supports, according to manufacturer's written instructions and as specified.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Lubricate bearings and sliding parts as recommended by manufacturer.
- D. Adjust seals to provide tight fit around entire perimeter.

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer
- B. Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

09/21/18

SECTION 08 33 26
OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-curtain overhead coiling grilles.

B. Related Sections:

1. Section 09 22 16 – Non-Structural Metal Framing: Door opening jamb and head members.
2. Section 08 70 00 – Door Hardware: Masterkeyed cylinders.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of controls, locking devices, and other accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Provide manufacturer's installation instructions.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

B. Certificate stating that installed materials comply with this specification.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001:2008 registered and a minimum of five years experience in producing grilles of the type specified.

- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00 Product Delivery, Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of grilles that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Cycle Life: Design grilles of standard construction for normal use of up to 5 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the grille.

2.2 OPEN-CURTAIN GRILLE ASSEMBLY

- A. Open-Curtain Grille: Overhead coiling, grille with a curtain having a network of horizontal rods that interconnect with vertical links.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cookson Company; www.cooksondoor.com (Basis-of-Design Manufacturer).
 - b. Cornell; www.cornelliron.com
 - c. Overhead Door Corporation; www.ohd.com
 - d. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: Cookson Company, Model ESG10.

2.3 COMPONENTS

- A. Grille Curtain Material: Solid 5056 H32 aluminum alloy, 5/16 inch (8 mm) diameter.
 - 1. Pattern: ESG10 Straight Pattern.
 - 2. Horizontal Rod Vertical Spacing: Approximately 2 inches on center.
 - 3. Link Spacing: Approximately 6 inches apart in a straight in-line.
 - 4. Vertical Chains: Grommetted aluminum links, 3/4 inch wide, positioned by E-rings on 6 inch centers. Provide double E-rings on horizontal bars on both sides of end chains to retain curtain in guides.

- B. Bottom Bar: 2 x 3-1/2 inch extruded aluminum tubular section.
- C. Guides, Tube Mounted: Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide aluminum tubes, floor saddles and hardware as recommended by manufacturer to support grille.
 - 1. Finish, Aluminum Guide Components:
 - a. Clear anodized finish.
- D. Counterbalance Shaft Assembly:
 - 1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.
 - 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of grille to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.
- E. Brackets: Fabricate from minimum 3/16 inch steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
 - 1. Finish: Zirconium treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.
- F. Hood and Fascia: 0.040 inch aluminum with reinforced top and bottom edges. Provide minimum 1/4 inch steel intermediate support brackets as required to prevent excessive sag.
 - 1. Finish:
 - a. Aluminum: Clear anodized.

2.4 ACCESSORIES

- A. Locking:
 - 1. Manual Push-Up: Center mounted turn handle locking mechanism that engages jamb guides at each end. Locking device installed on and operable from Student Commons side of curtain only.
 - 2. Lock Cylinders: As specified in Section 08 71 00 "Door Hardware" and keyed to building keying system.
 - 3. Keys: Two for each cylinder.
- B. Drive End and Spring Tension Covers: Provide 0.040 inch aluminum sheet covers at each end of grille hood that extend to adjacent walls to enclose exposed components. Finish of covers to be clear anodized, matching housing.

2.5 OPERATION

- A. Manual Push-Up: Provide pole with hook.

2.6 FINISH

- A. Aluminum Curtain and Bottom Bar:
 - 1. Curtain: Clear anodized.
 - 2. Bottom Bar: Clear anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.
- B. Install overhead coiling grilles and hoods at the mounting locations indicated for each grille.

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust grilles for ease of operation, free from warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

09/21/18

SECTION 08 34 73.13

METAL SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Metal sound control door assemblies.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames."
 - 2. Section 08 71 00 "Door Hardware."
 - 3. Section 09 91 00 "Painting" for field applied finish.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)
National Fire Protection Association (NFPA)
National Association of Architectural Metal Manufacturers (NAAMM)
Steel Door Institute (SDI)

- B. ASTM International:
 - 1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dipped Process.
 - 2. ASTM A1008 - Standard Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
 - 3. ASTM A1011 - Standard Specification for Steel, Hot-Rolled Sheet and Strip, Commercial.
 - 4. ASTM B117 - Standard Method of Salt Spray (Fog) Testing
 - 5. ASTM D1735 - Standard Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
 - 6. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss in Building Partitions.
 - 7. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Insulation in Buildings.
 - 8. ASTM E413 - Classification for Determination of Sound Transmission Class.
- C. Hollow Metal Manufacturers Association:
 - 1. HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.

1.3 COORDINATION

- A. Coordinate installation of anchorages for sound control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages. Deliver sleeves, inserts, anchor bolts, and items with integral anchors to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review procedures for coordinating frame and anchor installation with wall construction.
 - 2. Review required field quality-control procedures.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include sound ratings, construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: For sound control door assemblies.
 - 1. Include elevations of each door design.
 - 2. Include details of sound control seals, door bottoms, and thresholds.
 - 3. Include details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 4. Include frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Include locations of reinforcements and preparations for hardware.
 - 6. Include details of each different wall opening condition.
 - 7. Include details of anchorages, joints, field splices, and connections.
 - 8. Include details of accessories.
 - 9. Include details of moldings, removable stops, and glazing.
- C. Schedule: Provide a schedule of sound control door assemblies prepared using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: Provide certification that the door construction utilized has been tested at an independent laboratory in accordance with ASTM E90, and that the STC rating determined in accordance with ASTM E413, is not less than that specified in Part 2 of this Section.
 - 1. The laboratory referenced in the certification must be qualified under the National Voluntary Accreditation Program (NVLAP) of the U.S. Bureau of Standards.
 - 2. Certification must reference laboratory name, test report number, and date of test; substitution of test data not in accordance with ASTM E90 and E413 will not be acceptable.
- C. Cam Lift Hinges: When required to achieve STC, manufacturer to furnish laboratory test data certifying hinges have been cycled a minimum of 1,000,000 cycles while supporting a minimum door weight of 350 pounds.
- D. Installation Instructions: Provide recommended installation procedures which, upon approval by the architect, will become the basis for acceptance or rejection of the actual procedures used for installation.

- E. Sample Warranty: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sound control door assemblies to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide work of this Section designed and furnished by one manufacturer. Use a manufacturer who is ISO9001:2000 certified and has been engaged in the manufacture of Sound Retardant Metal Swinging Door systems for at least five (5) years immediately prior to the start of this work, and who has a history of successful production acceptable to the Architect.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Provide doors and frames meeting the requirements of either SDI A250.8-2003 or NAAMM HMMMA 861-2000 for standard sizes and designs.
- D. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- E. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Receipt: Upon receipt of product, all materials shall be thoroughly inspected and all discrepancies, deficiencies and/or damages shall be immediately reported to the supplier in writing.
- B. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Avoid the use of nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- D. Store doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.10 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Failure to meet sound rating requirements.
- b. Faulty operation of sound seals.
- c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sound Rating: Provide metal sound control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:

1. STC Rating: As indicated in the Door Schedule, as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.

2.2 STEEL SOUND CONTROL DOORS

A. Manufacturers: Acceptable manufacturers or equal:

Overly Door Co.; www.overlydoor.com
 Krieger Specialty Products; www.kriegerspecialtyproducts.com
 Substitutions: Section 01 25 13 "Product Options and Substitutions."

B. Basis-of-Design Products:

1. Overly Door Company, door.overly.com; Series SC, Model No. 4712022, with STC rating of 47.
2. Overly Door Company, door.overly.com; Series SC, Model No. 4712036, with STC rating of 47.
3. Overly Door Company, door.overly.com; Series SC, Model No. 4895161, with STC rating of 48. (* actual STC will be 1 STC less for each door leaf with vision panel).

C. Components: Assemblies to be complete with metal frame, door(s), sealing system (based on model specified), and Cam-Lift hinges (when required for model specified). If vision lights are specified for doors, metal loose stops (type based on model specified), glass and glazing shipped loose to be field installed.

D. Source Limitations: Obtain steel sound control door assemblies, including doors, frames, sound control seals, hinges, thresholds, and other items essential for sound control, from single source from single manufacturer.

E. Doors: Flush-design sound control doors, 1-3/4 inches thick, of seamless construction; with manufacturer's standard sound-retardant core as required to provide STC rating indicated. Face gauges, internal sound retardant core and perimeter door edge construction to be manufacturer's standard for the specified model. No lead or asbestos shall be permitted in door construction to achieve STC performance. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Fabricate according to NAAMM-HMMA 865.

1. Exterior Doors: Fabricate from metallic-coated steel sheet 0.052-inch nominal thickness or thicker as required to provide STC rating indicated.

2. Interior Doors: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.048-inch nominal thickness or thicker as required to achieve STC rating indicated.
3. Core: Manufacturer's standard sound control core.
4. Loose Stops for Glazed Lites in Doors: Same material as face sheets.
5. Top and Bottom Channels: Closed with continuous channels of same material as face sheets, spot welded to face sheets not more than 6 inches o.c.
6. Hardware Reinforcement: Same material as face sheets.

F. Materials:

1. Sound Retardant Metal Swinging Doors to be constructed from formed sheet steel or structural shapes and bars.
 - a. Sheet steel shall be commercial quality, level, cold rolled steel conforming to ASTM A366 or hot rolled, pickled and oiled steel conforming to ASTM A1011.
 - b. Steel shapes shall comply with ASTM A36 and steel bars with ASTM A108, Grade 1018.
 - c. Exterior units shall be fabricated from Galvannealed material conforming to ASTM A653 (A60) with a coating weight of not less than 0.60 ounces per square foot.
2. Glazing: As required by sound control door assembly manufacturer to comply with sound control requirements.

G. Finishes:

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.3 SOUND CONTROL FRAMES

- A. Frames: Fabricate sound control door frames with corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate according to NAAMM-HMMA 865.
1. Weld frames according to NAAMM-HMMA 820.
 2. Exterior Frames: Fabricate from metallic-coated steel sheet 0.079-inch nominal thickness or thicker as required to provide STC rating indicated.
 3. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, 14 gauge (0.067-inch) nominal thickness or thicker as required to provide STC rating indicated.
 4. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 865 of same material as face sheets.
 5. Jamb Anchors:
 - a. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048-inch nominal-thickness uncoated steel unless otherwise indicated.
 6. Floor Anchors: Not less than 0.079-inch nominal-thickness metallic-coated steel, and as follows:
 - a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

7. Ceiling Struts: Minimum 3/8-inch thick by 2-inch wide uncoated steel unless otherwise indicated.

B. Materials:

1. Frames for Sound Retardant Metal Frames to be constructed from formed sheet steel.
 - a. Sheet steel shall be commercial quality, level, cold rolled steel conforming to ASTM A366 or hot rolled, pickled and oiled steel conforming to ASTM A1011.
 - b. Exterior units shall be fabricated from Galvannealed material conforming to ASTM A653 (A60) with a coating weight of not less than 0.60 ounces per square foot.
2. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153, Class B.
3. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A153 or ASTM F2329.
4. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching sound control door frames of type indicated.
5. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

C. Finishes:

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.4 HARDWARE

- A. Sound Control Door Hardware: Manufacturer's standard sound control system, including head and jamb seals, door bottoms, cam-lift hinges, and thresholds, as required by testing to achieve STC rating indicated.

1. Head and Jamb Seals:
 - a. Neoprene Compression Seals: One-piece units consisting of closed-cell sponge neoprene seal held in place by metal retainer, with retainer cover of same material as door frame; attached to door frame with concealed screws.
2. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.
 - a. Mounting: Mortised or semimortised into bottom of door as required by testing to achieve STC rating indicated.
3. Door Bottoms: Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.
4. Cam-Lift Hinges: Full-mortise template type that raises door 1/2 inch when door is fully open; with hardened pin; fabricated from stainless steel.

- 5. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum.
 - a. Finish: Clear finish.
- B. Other Hardware: Comply with requirements in Section 08 71 00.

2.5 SOUND CONTROL ACCESSORIES

- A. Glazing: Manufacturers' standard factory-installed glazing.

2.6 FABRICATION

- A. Steel Sound Control Door Fabrication: Sound control doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.
 - 1. Seamless Edge Construction: Fabricate doors with faces joined at vertical edges by welding; welds shall be ground, filled, and dressed to make them invisible and to provide a smooth, flush surface.
 - 2. Exterior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
 - 3. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated. Provide fixed stops and moldings welded on secure side of door.
 - 4. Hardware Preparation: Factory prepare sound control doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
 - a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.
 - b. Locate door hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
 - 5. Tolerances: Fabricate doors to tolerances indicated in NAAMM-HMMA 865.
- B. Sound Control Frame Fabrication: Fabricate sound control frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
 - 1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches in height.
 - 2) Four anchors per jamb from 60 to 90 inches in height.
 - 3) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
5. Hardware Preparation: Factory prepare sound control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
 - a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
 - b. Locate hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
 - c. Provide dust cover boxes on all frame mortises.
6. Tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 865.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prior to installation, secure the services of a qualified representative of the manufacturer to visit the job site and instruct the contractor's personnel in proper installation and adjustment of the assemblies or secure services of manufacturer's factory trained and authorized installer to perform installation of assemblies.
- B. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- C. Prior to installation, adjust and securely brace sound control door frames to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- D. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install sound control door assemblies plumb, rigid, properly aligned, and securely fastened in place; in strict accordance with approved shop drawings. Comply with manufacturer's written instructions. Where installations require field welding, all work must be performed by certified welders in accordance with AWS D1.1/D1.3.
- B. Frames: Install sound control door frames in sizes and profiles indicated.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Install sound control frames with removable glazing stops located on secure side of opening.
 - b. Remove temporary braces only after frames or bucks have been properly set and secured.
 - c. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Fully fill frames with mineral-fiber insulation.
 4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
 6. Installation Tolerances: Adjust sound control door frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

- C. Doors: Fit sound control doors accurately in frames, within clearances indicated below. Shim as necessary.
 - 1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
 - a. Jambs: 1/8 inch.
 - b. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch.
 - c. Sill: Manufacturer's standard.
- D. Sound Control Seals: Where seals have been factory prefit and preinstalled and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.
- E. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.
- F. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 07 92 00 "Joint Sealants."
- G. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with sound control door assembly manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 MANUFACTURER SERVICES

- A. Upon installation, secure the services of a qualified representative of the manufacturer to visit the jobsite and inspect the complete installation of the door and frame assemblies, test all components thru a minimum of ten (10) cycles of operation and direct installer in correcting any non-conforming items found.

3.6 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and adjust seals, door bottoms, and other sound control hardware items right before final inspection. Leave work in complete and proper operating condition.
- B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
 - 1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, chemically treat surfaces to insure maximum paint adhesion, and apply touchup of compatible, rust-inhibitive, air-drying primer.

END OF SECTION

08/27/18

SECTION 08 35 13

INTERIOR FOLDING GLASS DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes furnishing and installing a top-hung sliding-folding aluminum-framed glass door or storefront system that includes:
 - 1. Aluminum frame.
 - 2. Threshold.
 - 3. Panels.
 - 4. Sliding-folding and locking hardware.
 - 5. Weatherstripping.
 - 6. Glass and glazing.
 - 7. Accessories as required for a complete working installation.
- B. Related Documents and Sections: Contractor to examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to, the following:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, Specification Sections, apply to this Section.
 - 2. Section 07 92 00 - Joint Sealers.
 - 3. Section 09 22 16, Non-Structural Metal Framing: Metal framing rough opening and reinforcement.

1.02 REFERENCES

- A. Reference Standards in accordance with Division 01 and current editions from the following:
- B. American Architectural Manufacturers Association; www.aamanet.org
 - 1. AAMA 503, Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls, and Sloped Glazing Systems
 - 2. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum
 - 3. AAMA 920, Operation / Cycling Performance
 - 4. AAMA 1303.5, Voluntary Specification for Forced Entry Resistant Aluminum Sliding Glass Doors
 - 5. AAMA 2604, Voluntary Specifications, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
 - 6. AAMA 2605, Voluntary Specifications, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
- C. American National Standards Institute; www.ansi.org
 - 1. ANSI Z97.1, Safety Performance Specifications and Methods of Test for Safety Glazing Material Used In Buildings
- D. ASTM International; www.astm.org

1. ASTM C1036, Standard Specification for Flat Glass
2. ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
3. ASTM E283, Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
4. ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
5. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
6. ASTM E413, Classification for Rating Sound Insulation
7. ASTM E547, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
8. ASTM E1332, Standard Classification for Rating Outdoor-Indoor Sound Attenuation

E. Consumer Product Safety Commission; www.cpsc.gov

1. CPSC 16CFR-1201, Safety Standard for Architectural Glazing Materials

F. DIN. "Deutsches Institut für Normung" (German institute for standardization); www.en-standard.eu/din-standards

- a. DIN 52210-3, Testing of acoustics in buildings - Airborne and impact sound insulation - Laboratory measurements of sound insulation of building elements and field measurements between rooms
- b. DIN 52210-4, Tests In Building Acoustics - Airborne And Impact Sound

G. National Fenestration Rating Council; www.nfrc.org

1. NFRC 100, Procedure for Determining Fenestration Product U-factors

H. Energy Star, U.S. Environmental Protection Agency (EPA) Program; www.energystar.gov

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate Folding Glass Storefront system and framing R.O.
- B. Preinstallation Meetings: See Section 01 31 19.

1.04 ACTION SUBMITTALS

- A. For submittal procedures see Section 01 33 00.
- B. Product Data: Submit manufacturer's printed product literature for each Folding Glass Storefront system to be incorporated into the Work. Show performance test results and details of construction relative to materials, dimensions of individual components, profiles and colors.
- C. Shop Drawings: Indicate Folding Glass Storefront system component sizes, dimensions and framing R.O., configuration, swing panels, direction of swing, stacking layout, typical head jamb, side jambs and sill details, type of glazing material, handle height and field measurements.
- D. Manufacturers' Instructions: Submit manufacturer's installation instructions.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit Owner's Manual from manufacturer. Identify with project name, location and completion date, and type and size of unit installed.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer capable of providing complete, precision built, engineered, pre-fitted units with a minimum twenty-five (25) years' experience in the sale of folding-sliding door systems for large openings in the North American market.
- B. Installer Qualifications: Installer experienced in the installation of manufacturer's products or other similar products for large openings. Installer to provide reference list of at least three (3) projects of similar scale and complexity successfully completed in the last three (3) years.
 - 1. Installer to be trained and certified by manufacturer.
- C. Single Source Responsibility: Furnish Folding Glass Storefront system materials from one manufacturer for entire Project.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, Section 01 60 00 requirements, and as follows:
 - 1. Deliver materials to job site in sealed, unopened cartons or crates.
 - 2. Upon receipt, inspect the shipment to ensure it is complete, in good condition and meets project requirements.
 - 3. Store material under cover in a clean and dry location, protecting units against weather and defacement or damage from construction activities, especially to the edges of panels.

1.08 FIELD CONDITIONS

- A. Field Measurements: Contractor to field verify dimensions of rough openings (R.O.) [and threshold depressions to receive sill.] Mark field measurements on shop drawing submittal.

1.09 WARRANTY

- A. Manufacturer Warranty: Provide Folding Glass Storefront system manufacturer's standard limited warranty as per manufacturer's published warranty document in force at time of purchase, subject to change, against defects in materials and workmanship.
 - 1. Warranty Period beginning with Date of Substantial Completion:
 - a. Rollers and Glass Seal Failure: Ten (10) years.
 - b. All Other Components Except Screens: Ten (10) years.
 - 2. Exception: Five (5) years if NOT installed by manufacturer's certified trained installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Product by Manufacturer: NanaWall SL45 by NANA WALL SYSTEMS, INC.
(www.nanawall.com)
NANA WALL SYSTEMS, INC.
100 Meadow Creek Drive, Corte Madera, CA 94925
Toll Free (800) 873-5673
Telephone: (415) 383-3148
Fax: (415) 383-0312
Email: info@nanawall.com

- B. Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.02 PERFORMANCE / DESIGN CRITERIA

- A. Performance Criteria (Lab Tested):
1. Air Infiltration (ASTM E283) - Flush Sill:
 - a. 0.25 cfm/ft² at a static air pressure difference: of 1.57 psf.
 - b. 0.78 cfm/ft² at 6.24 psf.
 2. Structural Loading (ASTM E330):
 - a. Load Structure: At 1.5 times design wind pressure with no glass breakage or permanent damage to fasteners or storefront components.
 - b. Design Pressure w/ Reinforced Locking Unit: Positive and Negative at 35 psf.
 3. Forced Entry (AAMA 1303.5 and AAMA CAWM 300): Meets requirements.
 4. Swing Panel - Operation / Cycling Performance (AAMA 920): 500,000 cycles.
 5. Thermal Performance U-factor: NFRC 100 rated
 6. EPA Energy Star Program: Rated.
- B. Design Criteria:
1. Sizes and Configurations: As indicated by the Drawings for selected number and size of panels, location of swing panels, and location of tracks and stacking bays.
 2. Unit Operation: Adjustable sliding and folding hardware with top and bottom tracks; inswing type.
 3. Panel Configuration: Straight
 4. Stack Storage Configuration: Inside.
 5. Mounting Type: Top hung
 6. Panel Type: Hinged.
 7. Panel Pairing Configuration: 2L and 2R; See drawings.

2.03 MATERIALS

- A. Sliding-Folding Glass Storefront Description: Monumental top-hung system designed for straight runs, segmented angle changes, center pivot, and capable of folding flat against adjacent walls. Manufacturer's standard frame and panel profiles, with head and floor tracks, side jambs and panels with dimensions as shown on Drawings.
1. Panels: Single lite.
 2. Panel Size (W x H): As indicated.
 3. Rail Depth: 1-3/4 inch.
 4. Head Width: 4-7/8 inch.
 5. Head and Jamb Rail Width: 2-1/8 inch.
 6. Bottom Rail Width: 2-1/16 inch for Saddle Sill, Flush Sill and Surface mounted Interior Sill.
 7. Aluminum Extrusion: AlMgSi0.5 alloy, 6063-T5.
 - a. Thickness: 0.078 inch (2.0 mm) nominal
 8. Aluminum Finish (including head track covers): Anodized (AAMA 611): Clear.
- B. Glass and Glazing:

1. Safety Glazing: In compliance with ANSI Z97.1 and CPSC 16CFR 1201.
 2. Glass Acoustical Performance (DIN 52210-3,4): R_w (STC 35, based on 1/4 inch (6 mm) single, laminated glass.
 3. Manufacturer's tempered and laminated glass lites, dry glazed with glass stops on the inside.
- C. Locking Hardware and Handles:
1. Main Entry Panel(s) for Models WITHOUT Swing Panel(s): Provide manufacturer's standard flat handle on inside only with concealed two point locking hardware operated by 180° turn of handle.
 2. Secondary Swing Panels and Pairs of Folding Panels: Provide manufacturer's flat handles and concealed one or two-point locking hardware operated by 180° turn of handle.
 3. Flat Handle - Finish:
 - a. Powder coated aluminum with color finish to match frame.
 4. Handle Height: 41-3/8 inch centered from bottom of panel or as otherwise indicated.
 5. Aluminum locking rods with standard fiberglass reinforced polyamide end caps at the top and bottom. Rods to have a stroke of 15/16 inch.
 6. Additional profile cylinders to be keyed alike.
- D. Sliding- Folding Hardware: Provide manufacturer's standard combination sliding and folding hardware with top and bottom tracks.
1. For each pair of folding panels, provide independent cardanic suspension for four (4) wheeled rollers coated with fiberglass reinforced polyamide upper running carriage and lower guide carriage.
 2. Swing Panel Hinges: Zinc die cast with finish closest match to finish of frame and panels and stainless steel security hinge pins with set-screws.
 3. Adjustment: Provide 1/16 inch in width per hinge adjustments without removing panels from tracks and without needing to remove panels from tracks.
 4. Sill Type:
 - a. Alternate flush sill (not thermally broken). OR
 - b. Surface mounted interior sill (not thermally broken).
 5. Finish: Aluminum with a clear anodized finish.
 - a. Cover plate over sill NOT acceptable.
- E. Weatherstripping: Manufacturer's double layer EPDM between panels, EPDM gasket and Q-Ion gasket, or brush seal between panel and frame, or brush seals with a two-layer fiberglass reinforced polyamide fin attached at both inner and outer edge of bottom of door panels with a recessed sill or on frame for sealing between panels and between panel and frame.
- F. Fasteners: Stainless steel screws for connecting frame components.

2.04 FABRICATION

- A. Extruded aluminum frame and panel profiles, corner connectors and hinges, sliding and folding hardware, locking hardware and handles, glass and glazing and weatherstripping components needed to construct a folding glass wall.
1. Each unit factory pre-assembled and shipped with all components and installation instructions.
 2. Exposed work to be carefully matched to produce continuity of line and design with all joints.
 3. No raw edges visible at joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examination and Acceptance of Conditions as follows:

1. Carefully examine rough openings with Installer present, for compliance with requirements affecting Work performance.
2. Examine surfaces of openings and verify dimensions; verify rough openings are level, plumb, and square with no unevenness, bowing, or bumps on the floor; and other conditions as required by the manufacturer to receive Work.
3. Verify the structural integrity of the header for deflection with live and dead loads limited to the lesser of $L/720$ of the span or 1/4 inch (6 mm). Provide structural support for lateral loads, and both wind load and eccentric load when the panels are stacked open.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install Folding Glass Storefront system in accordance with the Drawings, approved submittals, manufacturer's recommendations and installation instructions, and as follows:

1. Properly flash, waterproof and seal around opening perimeter.
2. Securely attach anchorage devices to rigidly fit frame in place, level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work
3. When lower track is designed to drain, provide connections to allow for drainage.
4. Install panels, handles, lockset, screens and other accessories in accordance with manufacturer's recommendations and instructions.

3.03 FIELD QUALITY CONTROL

A. Field Tests and Inspections per the following:

1. Verify the Folding Glass Storefront system operates and functions properly. Adjust hardware for proper operation.

B. Non-Conforming Work: Repair or replace non-conforming work as directed by the Architect; see General and Special Conditions, and Division 01, General Requirements.

3.04 CLEANING AND PROTECTION

- A. Keep units closed and protect Folding Glass Storefront installation against damage from construction activities.
- B. Remove protective coatings and use manufacturer recommended methods to clean exposed surfaces.

END OF SECTION

09/21/18

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Storefront framing.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 40 00 "Cold-Formed Metal Framing."
 - 2. Section 07 92 00 "Joint Sealants".
 - 3. Section 08 80 00 "Glazing".

1.02 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
 - Aluminum Association (AA)
 - ASTM International (ASTM)
 - American Architectural Manufacturers Association (AAMA)
 - California Association of Window Manufacturers (CAWM)
 - The Society for Protective Coatings (SSPC)

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed storefronts, showing the following:
 - a. Joinery, including concealed welds.

- b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
- 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- 4. Show fully detailed installation instructions/shop drawings for each type of component to be used within any adjoining system. Show anchorage (type and spacing) and system sealant/component application to provide waterproof system.
- C. Samples: Submit 12-inch long sample sections of aluminum extrusions and formed shapes showing color and finish. For color anodized components, submit two sets of two samples each, showing the extremes in color range.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed storefronts, for tests performed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Sample Warranties: For special warranties.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed storefronts to include in maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain storefronts, aluminum window systems, and finish through one source from a single manufacturer.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer/company will have a minimum of ten (10) years experience in performing work of this section and has specialized in the products installations.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- D. Provide test reports from AAMA accredited laboratories certifying the performances as specified in paragraph 2.02.C.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum storefront components in the manufacturer's original protective packaging.
- B. Store storefront sections out of contact with the ground and under a weather tight covering. Do not cover storefront sections with polyethylene film or similar coverings that will create a humidity chamber. If factory coated aluminum is protected with a strippable plastic film, remove the film before exposing the materials to direct sunlight.
- C. Protect factory-coated surfaces during shipping and handling to prevent scratching, gouging or other damage to the finish.

1.09 FIELD MEASUREMENTS

- A. Secure accurate field measurements required for the manufacture and installation of aluminum storefront work.
- B. Consult with the various trades whose work adjoins this work and be responsible for all measurements and the working out of all details.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.

- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
- 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
- 1. Arcadia, Inc., www.arcadiainc.com
 - 2. Kawneer Company, Inc.; www.kawneer.com
 - 3. EFCO Corp; www.efcocorp.com
 - 4. Oldcastle Building Envelope; www.oldcastlebe.com
 - 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product for Aluminum Storefront System: Arcadia, Inc., AG451T Series, 2" x 4-1/2" Thermally broken; center glazed system, screw spline, shear block, compensating stick or punched opening fabrication for 1" glass.

2.02 SYSTEM DESCRIPTION – STOREFRONT

- A. General: In addition to requirements shown or specified, comply with:
- 1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.
- B. Design Requirements: Arcadia AG451T Series is a framing system that provides for flush glazing on all sides without projected stops, with glass in the center of the frame. Framing system suitable for outside or inside glazing.
- C. Performance Requirements:
- 1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. of wall area at 6.24 PSF as measured in accordance with ASTM E283.
 - 2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 8 PSF.
 - 3. Limit mullion windload deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E 330.
 - 4. System shall not deflect more than 1/8" at the center point, or 1/16" at the center point of a horizontal member, once deadload points have been established.
 - 5. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
 - 6. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to

horizontal displacements associated with seismic movements and building sway.

7. Thermal Performance: When tested in accordance with AAMA 1503.1 the following results should be attained: U-Maximum 0.63/CRF – minimum of 59.
8. National Fenestration Rating Council (NFRC) specific application evaluation.

2.03 FRAMING MATERIALS AND ACCESSORIES

- A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10a T6).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM A164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
- C. Glazing Gasket:
 1. Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
 2. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.

2.04 GLAZING

- A. Glazing: Glazing types as shown on Drawings. Comply with Section 08 80 00 "Glazing."
- B. Glazing Sealants: As recommended by manufacturer.

2.05 FABRICATION

- A. Provide continuous sub-sill under sill members to collect water infiltration and divert from the interior of the system.
- B. Internally reinforce framing members and secure at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
- C. Locate fasteners to ensure concealment from view in the final assembly.

2.06 ALUMINUM FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm, or thicker.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.03 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 08 80 00 "Glazing."
- G. Install weatherseal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.04 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:

- a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
- 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.05 FIELD QUALITY CONTROL

- A. Field Quality-Control Testing: Perform the following test on representative areas of exterior aluminum-framed storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration. Conduct testing in presence of the IOR. Correct deficiencies observed as a result of these tests.
- B. Aluminum-framed storefronts will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION

01/04/19

SECTION 08 43 33

FOLDING GLASS STOREFRONTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Aluminum Bi-Folding Entrance Doors at Student Commons B102.

B. Related Sections:

1. Section 08 44 13 – Glazed Aluminum Curtain Walls, for swing entrance doors installed in curtain walls.

1.02 REFERENCES

- A. American Architectural Manufacturers Association (AAMA).
- B. American Society for Testing and Materials (ASTM).
- C. Aluminum Association (AA).

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for folding doors.

B. Shop Drawings:

1. Include plans, elevations, sections, and installation details.
2. Include clearances required for operation, access requirements, and accessory items.

C. Samples: For each exposed product and for each color and texture specified.

D. Product Schedule: For folding doors. Use same designations indicated on Drawings.

1.04 SYSTEM DESCRIPTION

A. General: In addition to requirements shown or specified, comply with:

1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.

B. Design Requirements: Arcadia 8000 Series Bi-Folding Aluminum Door is a single source package of door, doorframe and hardware that is engineered to allow doors in both directions to be folded to the side of an opening.

- C. Performance Requirements: Each assembly shall be tested by a recognized testing laboratory or agency in accordance with specified test methods.
 - 1. Resistance to corner racking shall be tested by the dual moment corner joint strength test.
 - 2. Structural uniform load shall be tested in accordance with ASTM E 330.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For folding doors to include in operation and maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Obtain entrances, storefronts, curtain walls, and finish through one source from a single manufacturer.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of fire-rated folding doors.
- C. Provide test reports from AAMA accredited laboratories certifying the performances as specified in Article 1.04.

1.08 WARRANTY

- A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer:
 - 1. Arcadia, Inc., 2301 E Vernon, Vernon, CA. Telephone 323/269-7300, Fax 323/269-7390.
 - 2. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product:
 - 1. Arcadia, Inc., 8000 Series Bi-Folding Aluminum Door, 1-3/4" thick.
 - a. Vertical stile: 5 inches.
 - b. Top rail: 5-1/8 inches.
 - c. Bottom rail: 10 inches.
 - d. Glazing Insert: Snap-in type for 1" infill.
 - 2. Major portions of the door stiles shall be nominal 0.125" thick and glass stops shall be 0.050" thick.

2.02 MATERIALS AND ACCESSORIES

- A. Door members: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10aT5).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164 shall be aluminum or steel, providing the steel is properly isolated from aluminum.

2.03 GLAZING GASKET

- A. Glazing Gasket: Compression-type design.

2.04 HARDWARE

- A. Hardware for 8000 Series Bi-Folding Aluminum Door shall be furnished and installed by the manufacturer and shall include the following standard hardware:
 - 1. Weatherstripping: A hard-backed polypile weatherstrip shall be installed in frame and interlockers and meeting stiles of bi-parting doors. Sliding panel supplied with double sweep at sill.
 - 2. Sill track: Aluminum.
 - 3. Stainless Steel Roller Guide Spindle.
 - 4. Guide Channel: Aluminum.
 - 5. Top Guide Carrier/Hanger.
 - 6. Adams Rite maximum security lock.
 - 7. Cylinders (interior and exterior); coordinate with Section 08 71 00 – Door Hardware.

2.05 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
 - 1. An Architectural Class I anodic coating conforming with AA-M12C22A31/AA-M12C22A41.
 - a. Anodize finish color: Colornodic (#11 Clear).

2.06 DOOR FABRICATION

- A. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, with optional MIG weld. Exposed screws not permitted.
- B. Prepare internal reinforcement for hardware.
- C. Custom hardware templates and physical hardware must be submitted prior to any fabrication.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine conditions and verify substrate conditions are acceptable for product installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. For folding doors supported by or anchored to permanent construction, advise installers of specific requirements for placement of anchorage devices. Furnish installers of other work with templates and drawings indicating locations of anchorage devices and similar items.

3.03 INSTALLATION

- A. Install folding doors in accordance with approved shop drawings and manufacturer's installation instructions. Install track in one piece.

3.04 ADJUSTING

- A. Adjust units to ensure smooth, quiet operation without warping or binding. Adjust hardware to function smoothly. Confirm that latches engage accurately and securely without forcing or binding.

END OF SECTION

09/21/18

SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Conventionally glazed aluminum curtain walls.
2. Exterior manual-swing entrance doors and door-frame units.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Document "00 01 08 "Deferred Approval Items" for requirements for Deferred Approval Items.
2. Section 07 84 43 "Joint Firestopping" perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain walls.
3. Section 07 92 00 "Joint Sealants" for joint sealants at glazed aluminum curtain walls.
4. Section 08 71 00 "Door Hardware" for door hardware for entrance doors.
5. Section 08 80 00 "Glazing" for glazing at glazed aluminum curtain walls.
6. Section 10 71 13 "Exterior Sun Control Devices" for sunshade system attached to curtain walls.

1.02 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

Aluminum Association (AA)
American Architectural Manufacturers Association (AAMA)
ASTM International (ASTM)
California Association of Window Manufacturers (CAWM)
The Society for Protective Coatings (SSPC)

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls and entrance doors. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of typical vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.07 DIVISION OF STATE ARCHITECT DEFERRED APPROVAL

- A. DSA Deferred Approval required for all glazed aluminum curtain wall units over 10 feet high.

- B. After Architect has reviewed the shop drawings and materials prepared and provided by Contractor for the Deferred Approval item, Architect will forward those materials to Division of the State Architect (DSA) for their review and comment.
- C. Contractor shall make all DSA required corrections, shall provide all DSA required documentation, and shall coordinate and resubmit those materials to Architect for forwarding to DSA.
- D. If a second round of corrections and resubmittals is required by DSA, Contractor shall be responsible for all time and coordination with DSA, without further involvement by Architect, or Contractor shall compensate Architect for their time if Contractor chooses to continue to involve Architect in the process with DSA.
- E. When Contractor has obtained DSA approval of the Deferred Approval materials, Contractor shall resubmit a copy of those same DSA approved materials to Architect for Record. No work shall commence on a Deferred Approval item until all these requirements have been completed.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Single Source Responsibility:
 - 1. Obtain entrances, storefronts, curtain walls, exterior sun control devices, and finish through one source from a single manufacturer.
- C. Provide test reports from AAMA accredited laboratories certifying the performances as specified in Article 2.01.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.09 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, peeling, or chipping.
 2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- C. Performance Requirements:
1. Air Infiltration: Limit air leakage through assembly to 0.06 CFM/min/sq. ft. of wall area at 6.24 PSF as measured in accordance with ASTM E283.
 2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 15 PSF.
 3. Dynamic Water Resistance: No water leakage, when measured in accordance with AAMA 501.1-94 with a dynamic test pressure of 15 PSF.
 4. Uniform Load Deflection under () psf positive and () psf negative design wind loads as indicated on drawings, normal to the plane of the wall, shall not exceed L/175 of the clear span or 3/4", when tested in accordance with ASTM E 330.

5. Uniform Load Structural at a pressure 1.5 times the design wind pressure in accordance with ASTM E 330.
6. System shall not deflect more than 1/8" at the center point, or 1/16" at the center point of a horizontal member, once deadload points have been established.
7. Thermal Movements: System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
8. Condensation Resistance Factor (CRF) in accordance with AAMA 1503.1-88 shall not be less than 55.
9. Thermal Transmittance (U-Value) in accordance with AAMA 1503.1-88 shall not be more than 0.65 BTU,hr/degree F/SF.
10. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
11. Sound transmission in accordance with ASTM E 90.
12. National Fenestration Rating Council (NFRC) specific application evaluation.

2.02 MANUFACTURERS

A. Acceptable Manufacturers:

1. Arcadia, Inc., www.arcadiainc.com.
2. Kawneer Company, Inc.; www.kawneer.com
3. EFCO Corp; www.efcocorp.com
4. Oldcastle Building Envelope; www.oldcastlebe.com
5. Substitutions: Section 01 25 13 – Product Options and Substitutions.

B. Basis-of-Design Product [Curtainwall System Type A]: Arcadia, Inc., T500 Series (OPG-25700) Series, 2-1/2" x 7" pressure plate glazed system for 1" glass.

C. Basis-of-Design Product [Curtainwall System Type B]: Arcadia, Inc., T500 Series (OPG-23011) Series, 2-1/2" x 10" pressure plate glazed system for 1" glass.

2.03 SYSTEM DESCRIPTION – CURTAIN WALL

A. General: In addition to requirements shown or specified, comply with:

1. Applicable provisions of AAMA Metal Curtain Wall Manual for design, materials, fabrication and installation of component parts.

B. Design Requirements: Arcadia T500 Series is a self-supporting curtain wall, with pressure plate and covers attached to the tongue of back member. Provides for two-color capability.

2.04 SYSTEM DESCRIPTION – STOREFRONT ENTRANCE DOORS

A. General: In addition to requirements shown or specified, comply with:

1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.

B. Design Requirements: Arcadia WS512+ HD Series Heavy Duty Wide Stile Entrance is a single source package of door, doorframe and hardware that is engineered for excessive traffic abuse.

C. Performance Requirements: Each assembly tested by a recognized testing laboratory or agency in accordance with specified test methods.

1. Tested by the dual moment corner joint strength test.

2.05 FRAMING MATERIALS AND ACCESSORIES

- A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10a T6).
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
 - 4. Finish: Clear anodic finish.
 - 5. Fabrication Method: Either factory- or field-fabricated system.
 - 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 7. Steel Reinforcement: As required by manufacturer.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.05 ENTRANCES

- A. Basis-of-Design Product for Aluminum Storefront System Entrance Doors:
 - 1. Arcadia, Inc., WS512+ HD Series, Heavy Duty Door 1-3/4".
 - 2. Vertical Stiles: 6 inches.
 - 3. Top Rail: 6 inches.
 - 4. Bottom Rail: 12 inches.
 - 5. Glazing Stops: (Square or Beveled) snap-in type for 1/4 inch or 1 inch infill.
 - 6. Major portions of the door stiles are nominal 0.188 inches and glass stops 0.050 inches thick.

2.06 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware".
- B. Hardware furnished and installed by the door manufacturer, including the following standard hardware:
 - 1. Weatherstripping: Hard-backed poly pile in door and/or frame. Meeting stile of all pair of doors have a double line hard-backed poly-pile astragal.
 - 2. Offset Saddle Threshold at Exterior Doors: Extruded Aluminum with ribbed surface.
- C. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

2.07 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."

- B. Glazing Gasket (Silicone Compatible):
 - 1. Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
- C. Glazing Sealants: Comply with Section 08 80 00 "Glazing."

2.08 MATERIALS

- A. Sheet and Plate: ASTM B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Extruded Structural Pipe and Tubes: ASTM B429.
- D. Structural Profiles: ASTM B308.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011.
- F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.09 ACCESSORIES

- A. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM.A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.10 FABRICATION

- A. Form or extrude aluminum shapes before finishing.

- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 7. System shall provide for two-piece horizontal framing so that all fasteners at intersection of horizontal and vertical members will be concealed.
 - 8. There shall be no exposed fasteners at perimeter sections.
- D. Fabricate components to resist water penetration as follows:
 - 1. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
 - 2. Make provisions at all sealed horizontals to keep moisture accumulation to the exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.11 FABRICATION - ENTRANCE DOORS

- A. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, with optional MIG weld. Exposed screws not permitted.
- B. Equip each door leaf with an adjusting mechanism, located in the top rail near the lock stile.
- C. Prepare internal reinforcement for door hardware.
- D. Custom hardware templates and physical hardware must be submitted prior to any fabrication.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.

- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.12 ALUMINUM FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
 - 1. An Architectural Class I, 0.018mm or thicker, anodic coating conforming with AAMA 611, AA-M12C22A41.
 - a. Anodize finish color: Colornodic, #11 Clear.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
- G. Seal joints watertight unless otherwise indicated.
- H. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- J. Install components plumb and true in alignment with established lines and grades.

3.03 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."

3.04 INSTALLATION OF WEATHERSEAL SEALANT

- A. Install weatherseal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.05 INSTALLATION OF ENTRANCE DOORS

- A. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.06 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.07 FIELD QUALITY CONTROL

- A. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.
- B. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration. Perform AAMA 501.2 testing at 40% and 80% completion at each system in this section. Conduct testing in presence of the IOR. Correct deficiencies observed as a result of these tests.
- B. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION

09/21/18

SECTION 08 45 23

FIBERGLASS SANDWICH PANEL SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pre-engineered self-supporting insulated translucent sandwich panel skylight system and accessories as shown and specified. Work includes providing and installing:
 - 1. Flat factory prefabricated structural insulated translucent sandwich panels.
 - 2. Aluminum installation system.
 - 3. Aluminum flashing attached to skylights.
 - 4. Aluminum sill flashing.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 06 10 53 - Miscellaneous Rough Carpentry.
 - 2. Section 07 52 00 - Modified Bituminous Membrane Roofing.
 - 3. Section 07 62 00 - Sheet Metal Flashing and Trim.
 - 4. Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

- A. The editions of standards and specifications referenced herein apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Architectural Manufacturers Association
ASTM International
ATI-ES - ATI Evaluation Service
A Division of Architectural Testing – Certification Services
National Fenestration Rating Council
Underwriters Laboratories

1.3 PRE-INSTALLATION CONFERENCE

- A. The skylight system, as part of the roofing system, shall comply with provision for pre-installation roofing conference as specified in Section 07 52 00.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of skylight components.
- B. Shop Drawings: Submit fully detailed shop drawings of the translucent panel systems showing size, shape, thickness and alloy of materials; methods of construction, glazing and anchorage; finishes; dimensions; and other pertinent data.

- C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
 - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
 - a. Sandwich panels: 14" x 28" units
 - b. Factory finished aluminum: 5" long sections
- D. Design Calculations: Submit calculations, sealed by a structural engineer licensed in the jurisdiction where the Project is located and responsible for their creation, demonstrating compliance with the design criteria specified.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- B. Product Test Reports: Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
 - 1. Test reports required are as follows:
 - a. ICC-ESR Evaluation Report or ATI Evaluation Service Report.
 - b. Flame spread and smoke developed: ASTM E84.
 - c. Burn extent: ASTM D635.
 - d. Color difference: ASTM D2244.
 - e. Impact Strength: UL 972 (Free falling ball method).
 - f. Bond Tensile Strength: ASTM C297 after aging by ASTM D1037.
 - g. Bond Shear Strength: ASTM D1002.
 - h. Beam Bending Strength: ASTM E72.
 - i. Fall Through Resistance: ASTM E661.
 - j. Insulating "U" Factor (by NFRC-100),
 - k. NFRC System U-Factor Certification: NFRC 700.
 - l. Solar Heat Gain Coefficient: NRFC or calculations.
 - m. Condensation Resistance Factor: AAMA 1503.
 - n. Air Leakage: ASTM E283.
 - o. Structural Performance: ASTM E330.
 - p. Water Penetration: E331.
 - q. Class A Roof Covering Burning Brand (ASTM E 108).
- C. Evaluation Reports: Before installation, submit data indicating conformance with ATI-ES Report CCRR-0173.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an installer who has been in the business of erecting similar materials for at least 5 consecutive years; and can show evidence of satisfactory completion of projects of similar size and scope.

C. Regulatory Requirements: Except as specified or indicated otherwise, translucent roof systems shall conform to 2016 CBC Title 24 Part 2 Chapter 15 - Roof Assemblies and Rooftop Structures and Chapter 26 - Plastic.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.9 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

B. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within period of 5 years after the date of Substantial Completion. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

C. Furnish Manufacturer's 10 year Warranty covering separation of faces from grid core, and/or abnormal color change of the exterior face.

D. Furnish Manufacturer's 20 year Warranty against reinforcing fiberbloom.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete skylight panel system.
 - 1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Standard skylight system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
 - 3. Structural Loads – Skylight System: Provide skylight system capable of handling the Design Loads as shown on Structural Drawings.
 - a. Roof Live Load: 20 psf.
 - b. Wind Uplift Pressure: 33.3 psf.

2.2 DESIGN REQUIREMENTS

- A. Translucent Skylight System: Design translucent skylight systems to support all dead loads plus a live load of 20 pounds per square foot.
- B. Use structural fasteners that provide a 4:1 safety factor when fully loaded.
- C. Design and anchor translucent panel assemblies so that there will be no objectionable distortion or excessive stress placed on fasteners or joinery due to expansion or contraction resulting from a 100 degree F temperature change.
- D. Do not begin fabrication of translucent panel systems until detail plans, specifications and engineering calculations have been accepted and signed by the Architect or Structural Engineer in general charge of design and the signature of the Architect or professional engineer who has been delegated responsibility covering the work shown on a particular plan or specification.

2.3 MANUFACTURER

- A. Acceptable manufacturer or equal: The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

Kalwall Corporation; www.kalwall.com

Substitutions: Section 01 25 13 – Product Options and Substitutions.

- B. Product Description and Basis of Design for Skylights: Kalwall Corporation, flat curb-type, insulated translucent sandwich panel skylight system.
 - 1. S-Line Skylights.

2.4 PANEL COMPONENTS

- A. Face Sheets:
 - 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.

- b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
 - 2. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1".
 - 3. Color Stability from Weathering: The full thickness of the exterior face shall not change color more than 3 CIE Units DELTA E by ASTM D2244 after 5 years outdoor South Florida weathering at 5-degrees facing south, determined by the average of at least 3 white samples without a protective film or coating to insure maximum, long term color stability. Color stability shall be unaffected by abrasion or scratching.
 - 4. Exterior Faces: The exterior faces shall have a permanent glass veil erosion barrier to provide maximum long-term resistance to reinforcing fiber exposure and shall be warranted against it for 20 years by face manufacturer. Sacrificial surface films or coatings are not acceptable erosion barriers.
 - 5. Exterior Face Impact Resistance: The exterior face sheet shall be uniform in strength and repel an impact equal to 70-foot pounds without fracture or tear when impacted by a 3-1/4 inch diameter, 5-pound free falling ball per UL 972, and be resistant to penetration by pencil point or other small, sharp objects.
 - 6. Appearance: The face sheets shall be uniform in color to prevent splotchy appearance. Faces shall be completely free of ridges and wrinkles that prevent proper surface contact in bonding to the grid core. Clusters of air bubbles/pinholes that collect moisture and dirt will not be acceptable.
 - a. Exterior face sheets: Smooth, 0.070" thick and Crystal in color.
 - b. Interior face sheets: Smooth, 0.045" thick and White in color.
 - c. Face sheets shall not vary more than $\pm 10\%$ in thickness and be uniform in color.
 - 7. Acrylic or polycarbonate faces are not acceptable.
- B. Grid Core:
- 1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
 - 2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.
- C. Laminate Adhesive:
- 1. Heat and pressure resin type engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass ICC testing requirements for "Acceptance Criteria for Sandwich Panel Adhesive".
 - 2. Minimum strength shall be 750-psi tensile strength by ASTM C297 after 2 exposures to 6-cycles each of the severe aging conditions prescribed by ASTM D1037.
 - 3. Minimum shear strength of panel adhesive by ASTM D1002 after exposure to four separate conditions:
 - a. 50% relative humidity at 68-degrees F: 540-psi.
 - b. 182-degrees F: 100-psi.
 - c. Accelerated Aging by ASTM D1037 at room temperature: 800-psi.

d. Accelerated Aging by ASTM D1037 at 182 degrees F: 250-psi.

D. Fasteners:

1. Exterior Fasteners: Aluminum alloy 2024-T4 or type 300 stainless steel.
2. Interior Fasteners: Cadmium coated steel or aluminum alloy 2024-T4.

E. Zinc-chromate: Fed. Spec. TT-P-645B.

F. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

G. Glazing Gaskets: Extruded neoprene gaskets, standard with the manufacturer of the translucent panel framing, in color as selected and approved to match aluminum finish.

H. Sealants: Mastic type sealing work required herein shall be made using approved sealant materials only. Sealant work and materials shall conform to requirements specified under Section 07 92 00.

2.5 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness: 2-3/4".
2. Light transmission: 20 %.
3. Solar heat gain coefficient: 0.28.
4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid, 0.23.
5. Complete insulated panel system shall have NFRC certified U-factor of 0.29.
6. Grid pattern: Nominal size: 12" x 24" oriented vertically along the panel length for skylights; pattern: Shoji.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200 deg F fire for minimum one hour without collapse or exterior flaming.

D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

E. Skylight System:

1. Skylight system shall pass Class A Roof Burning Brand Test By ASTM E 108.

F. Skylight System shall meet the fall through requirements of OSHA 1910.23 as demonstrated by testing in accordance with ASTM E 661, thereby not requiring supplemental screens or railings.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system:

1. Thermally broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

2. Skylight perimeter closures at curbs shall be factory sealed to panels.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish: As specified in paragraph 2.6.A.

2.5 FABRICATION

- A. General: Factory fabricate and preassemble translucent panels in the largest size assemblies consistent with economic considerations for shipping to and handling at the project site. Before shipment to the project site, completely assemble, mark, and disassemble work that cannot be permanently shop assembled to assure proper assembly in the field.
 1. Curb cap extrusions and flashing shall be supplied with standard units as appropriate.
- B. Structural Supporting Members: Fabricate rafter bars, cross gutters, perimeter curb members and reinforcing members of extruded aluminum having a wall thickness sufficient to meet design loads but not less than 0.109-inch. Shapes shown are representations of design, function, and required profile. Dimensions shown are minimum. Shapes of equivalent design, dimensions, profile, and function may be used subject to Architect's approval.
- C. Clamping Bars and Other Nonstructural Members: Fabricate members of extruded aluminum having a wall thickness of not less than 0.094-inch. Attach clamping bars to glazing bars with #14 stainless steel tapping screws or 1/4-inch diameter stainless steel machine screws.
- D. Flashings, Trim, Closures and Other Accessory Items: Fabricate these items of formed sheet aluminum having a minimum thickness of 0.032-inch.
- E. Welding: Welding shall be by the heliarc process. Where possible, locate welds on unexposed surfaces. On exposed surfaces, dress welds smooth. Remove flux and spatter from surfaces immediately after welding.
- F. Connections: Properly fit and join translucent skylight rafter bars and cross gutters to perimeter curb by welding or mechanical connections as determined by design and fabrication conditions. Extruded aluminum curbs shall be mitered and heliarc welded watertight at corners.
- G. Condensate Drainage: Provide horizontal and vertical framing members with a fully concealed condensate drainage system as an integral part of the extruded aluminum shape. The drainage system shall direct all accumulated moisture to the exterior through curb weep holes or other equivalent means.

2.6 FINISH

- A. Painted Finish: Provide exposed aluminum surfaces with manufacturer's factory applied high-performance, corrosion-resistant finish, which meets the performance requirements of AAMA 2604 – Voluntary Specification for High Performance Organic Coatings on Aluminum Extrusions and Panels. Color to be selected by Architect from manufacturer's standards.
- B. Finish exposed fasteners to match the color finish of the adjacent material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify field dimensions and adjust framing construction and glazing panel size to accommodate field conditions.
- B. Carefully examine the openings to which panel systems will be installed to ensure that the following conditions are met:
 - 1. Rough openings are square and sized as indicated on shop drawings within tolerance of 1/2-inch.
 - 2. Curbs are in place and provided with cants and base flashings as specified in Section 07 52 00.
 - 3. Tops of curbs are level within a noncumulative tolerance of 1/4-inch. Tops of curbs to match skylight slope.
- C. Do not start work until deficiencies have been corrected. Start of work of this section constitutes acceptance of the surfaces.

3.2 PREPARATION

- A. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

- A. Install the skylight system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
 - 1. Install units plumb, true, without warping or racking of panels and without waves or buckling.
 - 2. Exercise care in the drilling of anchorage holes to obtain full rated strength from attachment devices.
 - 3. Anchor component parts securely in place by permanent mechanical attachment system.
 - 4. Accommodate thermal and mechanical movements.
 - 5. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

- C. Expansion and Contraction: Take precautions during erection to provide for thermal movement from a minimum ambient air temperature shift of 100-degrees F without creating undue stresses in the fasteners, sealants, glazing materials, or the support system.
- D. Sealants: Apply sealants where shown on shop drawings. Sealant shall be as specified in Section 07 92 00 and approved by translucent panel manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Water Test: Installer to test skylights according to procedures in AAMA 501.2. Test shall be witnessed and documented by the IOR.
- B. Structural Load Test: When required, Laboratory of Record to perform structural load test per DSA-103 List of Required Structural Tests and Special Inspections – 2016 CBC. Testing is not required for a product with a valid evaluation service report per DSA IR A-5, or for a product that can be justified by structural calculation.
- C. Repair or replace work that does not pass testing or that is damaged by testing and retest work⁹

3.5 CLEANING

- A. After installation clean panels, framing members and accessories. Leave translucent panels in a clear, scratch free condition, inside and out, with labels removed. Do not use abrasive materials of any kind in cleaning translucent roof surfaces. Remove rubbish, debris, cartons and crates from the premises.

3.6 PROTECTION

- A. Subsequent to installation of the translucent panels, exercise caution to prevent substances that might damage the glazing panels or metal surfaces from lying on or flowing over the installed system. Immediately remove or rinse off such damaging substances.

END OF SECTION

03/19/19

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Aluminum window for interior Control Room location.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 07 92 00 - Sealants.
 - 2. Section 08 80 00 - Glass and glazing.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

Aluminum Association (AA)
American National Standards Institute (ANSI)
ASTM International (ASTM)
American Architectural Manufacturers Association (AAMA)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.
 - 1. Include plans, elevations, sections, hardware, accessories, operational clearances, and details of installation, including anchor, flashing, and sealant installation. Clearly show relationship to work of other trades.
- C. Samples: Submit samples of a major aluminum extrusion 12-inches long and an aluminum sheet 2" by 4" square showing color of the specified finish.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.

- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA/WDMA/CSA 101/I.S.2/A440.
- D. Single Source Responsibility: Provide each type of aluminum window units from one source and produced by a single manufacturer.
- E. Design Concept: The drawings indicate the size, profiles, and dimensional requirements of the aluminum window types required and are based upon the specific type and model of one manufacturer. Aluminum windows by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Before shipment from the factory, apply a protective covering of adhesive paper, waterproof tape or strippable plastic over finished surfaces of windows. Store windows and components out of contact with the ground, under a watertight covering, so as to prevent bending, warping, discoloration, or other damage.

1.7 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 2 years from date of Substantial Completion.
 - b. Insulated Glazing Units: 10 years from date of Substantial Completion.
 - c. Laminated Glass Units: 5 years from date of Substantial Completion.

- d. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum window units that comply with performance requirements specified, as demonstrated by testing manufacturer's corresponding stock systems according to test methods specified.
- B. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AAMA certified with label attached to each window.
- C. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: CW.
 - 2. Minimum Performance Grade: 40.
- D. Water Penetration: When tested in accordance with ASTM E331, there shall be no water penetration at a test pressure of 6.24 psf.
- E. Sound Transmission Class (STC): Rated at not less than 33 STC when tested for laboratory sound transmission loss according to ASTM E413.

2.2 ALUMINUM WINDOWS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Fleetwood Windows and Doors, Inc.; www.fleetwoodusa.com; Series 250. (Basis-of-Design).
 - 2. EFCO Corporation; www.efcocorp.com; Series 3500.
 - 3. Arcadia Inc.; www.arcadiainc.com; ULT5000 Series.
 - 4. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Horizontal sliding.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- D. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered where indicated on Drawings.
- E. Insulating-Glass Units: ASTM E2190.
 - 1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered.

2. Lites: Two.
 3. Filling: Fill space between glass lites with air.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- H. Horizontal-Sliding Window Hardware:
1. Sill Cap/Track: Manufacturer's standard of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
 3. Roller Assemblies: Low-friction design.
- I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

- A. Sealants: Specified in Section 07 92 00.
- B. Bituminous Coatings: Cold applied asphalt mastic meeting the requirements of SSPC PS 12-82, compounded for 30-mil thickness per coat.

2.4 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Provide manufacturer's high performance interlockers and high performance meeting stiles.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISH

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.
- C. Finish exposed fasteners to match the color finish of the adjacent material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install the aluminum window units plumb, square, level and in accordance with the shop drawings and manufacturer's recommendations.

- C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- D. Set sill members and other members in a bed of compound or with joint fillers or gaskets, to provide watertight construction. Refer to Section 07 92 00 for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

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Not Used:

- A. Product Standard: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA/WDMA/CSA 101/I.S.2/A440 for type, grade, and performance class of window units specified.
 - 1. Certification: Each window unit shall bear the AAMA "Certification Label" warranting that the product complies with AAMA/WDMA/CSA 101/I.S.2/A440. Test window units without "Certification Label" for conformance with AAMA/WDMA/CSA 101/I.S.2/A440 and submit the test reports to the Architect.
- B. Acceptable products or equal:
 - 1. Horizontal Sliding Windows: Window Grade and Class; AAMA/WDMA/CSA 101/I.S.2/A440, designation C40.

4.3 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by window manufacturer for strength, corrosion resistance and application of required finish, but not less than 22,000 psi ultimate tensile strength.
- B. Fasteners: Aluminum, nonmagnetic stainless steel or other non-corrosive material compatible with aluminum. Plated or coated materials not permitted.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 1.125-inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard non-corrosive pressed-in splined grommet nuts.
- C. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron meeting the requirements of ASTM B633; provide sufficient strength to withstand design pressure specified.
- D. Weatherstripping:
 - 1. Horizontal Sliding Windows: Double weatherstrip sill, head and jambs with wool, polypropylene, or nylon pile. Double weatherstrip meeting rail with molded PVC or pile mohair.
- E. Glass and Glazing: Glass and glazing requirements are specified in Section 08 80 00.

4.4 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.
- B. Sill Cap/Track: Manufacturer's standard, of dimensions and profile indicated; designed to comply with the performance requirements indicated.
- C. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
- D. Sash Roller Assemblies: Low-friction design; steel lubricated ball-bearing rollers with nylon

tires, or nylon rollers.

2.3 FABRICATION

- A. General: Fabricate aluminum window units to comply with specified standards. Include a complete system for assembly of components and anchorage of window units.
 - 1. Provide units that are reglazable without dismantling sash or ventilator framing.
 - 2. Prepare window sash or ventilators for glazing except where preglazing at the factory is specified.
 - 3. Provide manufacturer's high performance interlockers and high performance meeting stiles.
- B. Preglazed Fabrication: Preglaze window units at factory where possible and practical for applications. Comply with requirements of Section 08 80 00.
- C. Provide mullions and cover plates matching window units, complete with anchors for support to structure and for installation of window units. Allow for erection tolerances and provide for movements of window units due to thermal expansion and building deflections.
- D. Miter corners of ventilators; fabricate all four corners of sash with concealed internal corner block reinforcing angles, minimum 1/4-inch thick. Tenon joint frames that intersect with meeting rails or mullions, set on sealant as specified in Section 07900. Seal openings, cracks, joints with sealant specified. Allow minimum 1/8-inch clear between glass and metal for glazing compound.
- E. Organic Finish:
 - 1. Primer: Finish coating formulator's standard epoxy primer as recommended for the substrate and coating process used.
 - 2. Fluorocarbon Finish: Coating which contains not less than 70% Kynar 500 as manufactured by Atochem North America, Inc. or Hylar 5000 as manufactured by Ausimont USA, Inc., polyvinylidene fluoride (PVDF) resin meeting the requirements of AAMA 605.2-92. Acceptable products or equal, no known equals:
Akzo; Trinar
Glidden Coatings and Resins; Nubelar
Morton International; Fluoroceram
PPG Industries; Duranar
Valspar; Fluoropon
 - 3. Touch-Up Paint: As recommended by the coating formulator for field application.
 - 4. Colors: Custom color to match Hollow Metal Frames.
- F. Application:
 - 1. Surface Preparation: Thoroughly clean and etch surfaces to receive coating, and apply a chromate conversion pretreatment in accordance with the methods approved by the coating formulator.
 - 2. Primer: Prime the cleaned and treated surfaces with baked-on epoxy primer applied to achieve a dry film thickness of not less than 0.2-mils.
 - 3. Fluorocarbon Finish:

- a. Aluminum Extrusions: Electrostatically spray the primed surface with the finish coat applied to achieve a dry film thickness of not less than 0.8-mils and oven bake at a temperature of not less than 450 degrees F in accordance with the coating formulators written procedures.
 - b. Aluminum Sheets: Finish the primed surface using the coil coating process to achieve a dry film thickness of not less than 0.8-mils and oven bake at a temperature of not less than 475 degrees F in accordance with the coating formulators written procedures.
- G. Before starting fabrication, thoroughly examine actual field conditions affecting the work. Take actual field measurements of all spaces and places into which this work is to be fitted. If the field investigations indicate that the work of other trades does not conform to the design dimensions and conditions, make corrections before installation of windows.

4.5 ADJUSTING

- A. Make adjustments to assure that ventilators operate smoothly without binding and that weatherstripping permits ventilator to close easily and tight with watertight contact between metal.

4.6 CLEANING

- A. Clean exposed surfaces promptly after installation of windows. Do not damage protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

4.7 PROTECTION

- A. Immediately before final completion remove the factory applied protective covering.

SECTION 08 56 73

SOUND CONTROL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Sound Retardant Metal Fixed Window Systems where shown on drawings and specified herein.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 08 80 00 "Glazing."
 - 2. Section 09 91 00 "Painting" for field applied finish.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. ASTM International:
 - 1. ASTM A1008 - Standard Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
 - 2. ASTM A1011 - Standard Specification for Steel, Hot-Rolled Sheet and Strip, Commercial.
 - 3. ASTM A653 - Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron alloy Coated (Galvannealed) by the Hot Dipped Process.
 - 4. ASTM B117 - Standard Method of Salt Spray (Fog) Testing.
 - 5. ASTM D1735 - Standard Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
 - 6. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss in Building Partitions.
 - 7. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Insulation in Buildings.
 - 8. ASTM E413 - Classification for Determination of Sound Transmission Class.
- C. Hollow Metal Manufacturers Association:
 - 1. HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Submit a schedule of items to be provided under this Section along with shop drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this section with the work of adjacent trades.
- C. Schedule: Provide a schedule of sound control windows prepared using same reference numbers for details and openings as those on Drawings.

- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Provide certification that the fixed window construction utilized has been tested at an independent laboratory in accordance with ASTM E90, and that the STC rating determined in accordance with ASTM E413, is not less than that specified in Part 2 of this Section.
 - 1. The laboratory referenced in the certification must be qualified under the National Voluntary Accreditation Program (NVLAP) of the U.S. Bureau of Standards.
 - 2. Certification must reference laboratory name, test report number, and date of test; substitution of test data not in accordance with ASTM E90 and E413 will not be acceptable.
- B. Installation Instructions: Provide recommended installation procedures which, upon approval by the Architect, will become the basis for acceptance or rejection of the actual procedures used for installation.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide work of this Section designed and furnished by one manufacturer. Use a manufacturer who is ISO9001:2000 certified and has been engaged in the manufacture of Sound Retardant Metal Fixed Window systems for at least ten (10) years immediately prior to the start of this work, and who has a history of successful production acceptable to the Architect.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Receipt: Upon receipt of product, all materials shall be thoroughly inspected and all discrepancies, deficiencies and/or damages shall be immediately reported to the supplier in writing.
- B. Storage: Store all materials on planks or dunnage in a dry location in a vertical position, spaced by blocking to permit air circulation between units. Cover all material or store in a controlled area to protect from damage.

1.7 WARRANTY

- A. Warranty: Upon completion of the work of this Section, provide the Architect with two (2) copies of the manufacturer's standard written one (1) year warranty.

PART 2 - PRODUCTS

2.1 DESIGN

- A. Basis-of-Design Product: Sound Retardant Metal Fixed Window System designs are based on those manufactured by Overly Door Company, Greensburg, PA 15601. Tel 800-979-7300, Fax 724-830-2871.
- B. Performance: Sound Retardant Metal Fixed Window System to be Overly Model No. 4292276 or equal with STC rating of 42 when tested as a system in accordance with ASTM E90 and ASTM E413.

- C. Components: Assemblies to be complete with metal frame, glass, and glazing. Glass, and glazing shipped loose to be field installed.

2.2 FABRICATION

- A. Materials: Sound Retardant Metal Fixed Window Frames to be constructed from formed sheet steel or structural shapes and bars.
 - 1. Sheet steel: Commercial quality, level, cold rolled steel conforming to ASTM A1008 or hot rolled, pickled and oiled steel conforming to ASTM A1011.
 - 2. Steel shapes: ASTM A36.
 - 3. Steel bars: ASTM A108, Grade 1018.
- B. Frame Design: Sound Retardant Metal Fixed Window Frames shall be 14 gauge minimum welded units with integral trim and shipped with temporary spreader. Knock-down frames are not acceptable, unless sizes of frames exceed shipping limitations. After installation, field splices required because of shipping limitations must be field welded by certified welders per manufacturer's instructions and in accordance with AWS D1.1/D1.3.
- C. Anchors: Provide suitable anchors to properly install frames in partition types shown on Architects drawings.
- D. Glazing: 3/4" Laminated Glass, as specified in Section 08 80 00 "Glazing."
- E. Painting and Cleaning: After fabrication of frames, remove all tool marks and surface imperfections and dress smooth exposed faces of all welded joints. Chemically treat all surfaces to insure maximum paint adhesion and coat with manufacturer's standard water-based rust-inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prior to installation, secure the services of a qualified representative of the manufacturer to visit the job site and instruct the contractor's personnel in proper installation and adjustment of the assemblies or secure services of manufacturer's factory trained and authorized installer to perform installation of assemblies.

3.3 INSTALLATION

- A. Install work of this Section in strict accordance with approved shop drawings and manufacturer's recommended installation instructions. Where installations require field welding, all work must be performed by certified welders in accordance with AWS D1.1/D1.3.

3.4 MANUFACTURER SERVICES

- A. Upon installation, secure the services of a qualified representative of the manufacturer to visit the jobsite and inspect the complete installation of the fixed window assemblies, and direct installer in correcting any non-conforming items found.

END OF SECTION

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions of Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware, including electric hardware.
 - 2. Storefront and Entrance door hardware.
 - 3. Low-energy door operators plus sensors and actuators.
 - 4. Thresholds, gasketing and weather-stripping.
 - 5. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Section 08 11 13 - Hollow Metal Doors and Frames.
 - 2. Section 08 14 16 - Flush Wood Doors.
 - 3. Section 08 14 33 - Stile and Rail Wood Doors.
 - 4. Section 08 32 13 - Sliding Aluminum-Framed Glass Doors.
 - 5. Section 08 33 13 - Coiling Counter Doors.
 - 6. Section 08 33 26 - Overhead Coiling Grilles.
 - 7. Section 08 41 13 - Aluminum-Framed Entrances and Storefront.
 - 8. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.3 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. 2016 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association.
- C. DHI – Door and Hardware Institute.
- D. SDI - Steel Door Institute.
- E. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- F. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies.
 - 2. UL 305 - Panic Hardware.

- G. WHI - Warnock Hersey Incorporated.

1.4 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

1.5 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

1.6 SUBMITTALS AND SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
 - 1. Include a Cover Sheet with:
 - a. Job Name, location, telephone number.
 - b. Architects name, location and telephone number.
 - c. Contractors name, location, telephone number and job number.
 - d. Suppliers name, location, telephone number and job number.
 - e. Hardware consultant's name, location and telephone number.
 - 2. Job Index information included:
 - a. Numerical door number index including; door number, hardware heading number and page number.
 - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
 - c. Manufacturers' names and abbreviations for all materials.
 - d. Explanation of abbreviations, symbols, and codes used in the schedule.
 - e. Mounting locations for hardware.
 - f. Clarification statements or questions.
 - g. Catalog cuts and manufacturer's technical data and instructions.
 - 3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacturer abbreviation.

- D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.
- C. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- D. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.9 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Responsible for detailing, scheduling and ordering of finish hardware.
 - 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
 - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.11 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 - 1. Locksets: Ten (10) years.
 - 2. Closers: Thirty (30) years.
 - 3. Exit devices: Three (3) years.
 - 4. All other hardware: Two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.2 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
1. Hinges shall be sized in accordance with the following:
 - a. Height:
 - 1) Doors up to 42" wide: 4-1/2" inches.
 - 2) Doors 43" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.
- C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.
1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
 - a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
 - b. Offset lever pull – minimum 1,600 foot pounds without gaining access
 - c. Vertical lever impact – minimum 100 impacts without gaining access
 2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers

3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Provide wired electrified options as scheduled in the hardware sets.
 - a. 12 through 24 volt DC operating capability, auto-detecting
 - b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
 - c. 0.230A (230mA) maximum current draw
 - d. 0.010A (10mA) holding current
 - e. Modular / "plug in" request to exit switch
12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

D. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
11. Furnish glass bead kits for vision lites where required.
12. All Exit Devices to be sex-bolted to the doors.
13. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
 - a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.

E. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel

- main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
 5. Closers shall be installed to permit doors to swing 180 degrees.
 6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
 7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
 8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.
- F. Flush Bolts and Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
 2. Provide dust proof strikes at openings using bottom bolts.
- G. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- H. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- I. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
 3. Use 1/4" diameter fasteners, red-head flat-head sleeve anchors (SS/FHSL).
 4. Thresholds shall comply with CBC Section 11B-404.2.5.
- J. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 and NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacturer -- careful coordination required.
 3. Smoke and Draft Control Doors, Provide UL10C Classified complies with NFPA 80 and NFPA 252 for use on "S" labeled Positive Pressure door assemblies.
- K. Door Shoes and Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- L. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.3 KEYING

- A. Furnish a Schlage masterkey system as directed by the Owner or Architect.
- B. A detailed keying schedule is to be prepared by the Owner and/or Architect in consultation with a representative of the lock manufacturer. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Establish a new masterkey system for this project as directed by the keying schedule.
- D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
- E. Furnish construction keying for doors requiring locking during construction.
- F. Furnish mechanical keys as follows:
1. Furnish 2 cut change keys for each different change key code.
 2. Furnish 1 uncut key blank for each change key code.
 3. Furnish 6 cut masterkeys for each different masterkey set.
 4. Furnish 3 uncut key blanks for each masterkey set.
 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
 6. Furnish 1 cut control key cut to each SKD combination.
- G. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

2.4 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.5 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2016 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.5 FIELD QUALITY CONTROL

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.6 SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors

they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

CRO =	Crown Industrial	Gate Hardware
GLY =	Glynn-Johnson Corporation	Overhead Door Stops
IVE =	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Kick Plates, Door Stops & Silencers
LCN =	LCN	Door Closers
SCH =	Schlage Lock Company	Locks, Latches & Cylinders
VON =	Von Duprin	Exit Devices
ZER =	Zero International	Thresholds, Gasketing & Weather-stripping

SPEXTRA: 433719

GROUP NO. 01

2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091	626	SCH
2	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	SET	SEAL SET	WEATHERSTRIP BY DOOR / FRAME MANUFACTURER		
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 02

6	EA	CAM LIFT HINGE	BY STC ASSEMBLY MFR		
1	EA	MULLION	BY STC ASSEMBLY MFR		
1	EA	PANIC HARDWARE	CD-PA-AX-98-EO	626	VON
1	EA	PANIC HARDWARE	LD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
2	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	SET	SOUND SEAL	BY STC ASSEMBLY MFR		
2	EA	DOOR BOTTOM	BY STC ASSEMBLY MFR		
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 03

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 04

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	SET	SEAL SET	WEATHERSTRIP BY DOOR / FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 05

1	EA	CONT. HINGE	700	630	IVE
1	EA	PANIC HARDWARE	CD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4111 AVB EDA SRI	689	LCN
1	EA	FLOOR STOP	FS18L	BLK	IVE

GROUP NO. 06

1	EA	CONT. HINGE	700	630	IVE
1	EA	VANDL CLASSROOM SEC	ND95PD RHO XN12-035	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 07

3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96PD RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 08

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	SET	SEAL SET	WEATHERSTRIP BY DOOR / FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	ROOF CURB ADJUSTABLE THRESHOLD	105 and 107 as required to fit width.	A	ZER
1	EA	ADJUSTABLE THRESHOLD PLATE	672	A	ZER
1	EA	SILL GASKETING	475	A	ZER

GROUP NO. 09

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	CD-PA-AX-98-L-NL-06	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	OFFSET THRESHOLD	1-3	A	ZER

GROUP NO. 10

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	ROOF CURB ADJUSTABLE THRESHOLD	105 and 107 as required to fit width.	A	ZER
1	EA	ADJUSTABLE THRESHOLD PLATE	672	A	ZER
1	EA	SILL GASKETING	475	A	ZER

GROUP NO. 11

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	WALL STOP/HOLDER	WS40	626	IVE

GASKETING FURNISHED WITH ALUMINUM FRAME ASSEMBLY

GROUP NO. 12

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 13

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 14

3	EA	CAM LIFT HINGE	BY STC ASSEMBLY MFR		
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SOUND SEAL	BY STC ASSEMBLY MFR		
1	EA	DOOR BOTTOM	BY STC ASSEMBLY MFR		
1	EA	THRESHOLD	512	A	NGP

GROUP NO. 15

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 16

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	GASKETING	312A-S	A	ZER
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	411	A	NGP

GROUP NO. 17

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	WS40	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 18

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 19

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 20

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 21

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE

GROUP NO. 22

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	OH STOP	90S	630	GLY
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 23

3	EA	CAM LIFT HINGE	BY STC ASSEMBLY MFR		
1	EA	CLASSROOM SECURITY	ND75PD RHO XN12-035	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SOUND SEAL	BY STC ASSEMBLY MFR		
1	EA	DOOR BOTTOM	BY STC ASSEMBLY MFR		
1	EA	THRESHOLD	512	A	NGP

GASKETING FURNISHED WITH ALUMINUM FRAME ASSEMBLY

GROUP NO. 24

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 25

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 26

1	EA	CAM-LIFT HINGE	BY STC DOOR MFR		B/O
1	EA	PANIC HARDWARE	LD-PA-AX-98-L-2SI-06	626	VON
2	EA	RIM CYLINDER	20-057	626	SCH
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SOUND SEAL	BY STC ASSEMBLY MFR		
1	EA	DOOR BOTTOM	BY STC ASSEMBLY MFR		
1	EA	THRESHOLD	512	A	NGP

GROUP NO. 27

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	LD-PA-AX-98-L-2SI-06	626	VON
2	EA	RIM CYLINDER	20-057	626	SCH
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 28

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	LD-PA-AX-98-L-2SI-06	626	VON
2	EA	RIM CYLINDER	20-057	626	SCH
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 29

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	LD-PA-AX-98-L-2SI-06	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	FLOOR STOP	FS439	682	IVE

WEATHER-STRIPPING FURNISHED WITH DOOR & FRAME ASSEMBLY

GROUP NO. 30

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 31

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 32

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY WITH INDICATOR	L9056P 17A L583-363 L283-722	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 33

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY WITH INDICATOR	L9056P 17A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 34

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FAC RESTRM W/IND CYL	ND85PD RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 35

6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
2	EA	OH STOP	450S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 36

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
2	EA	OH STOP	90S	630	GLY
1	EA	ASTRAGAL	44SP OR BY DOOR MFR.		ZER
2	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 37

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
2	EA	WALL STOP/HOLDER	WS40	626	IVE
1	EA	ASTRAGAL	44SP OR BY DOOR MFR.		ZER
2	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 38

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CD-PA-AX-98-L-NL-06	626	VON
1	EA	PANIC HARDWARE	LD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
2	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
2	EA	FLOOR STOP/HOLDER	FS41	626	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
2	EA	MEETING STILE	328AA-S	AA	ZER

GROUP NO. 39

2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CD-PA-AX-98-L-NL-06	626	VON
1	EA	PANIC HARDWARE	LD-PA-AX-98-EO	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	MORTISE CYLINDER	26-091	626	SCH
1	EA	MORTISE CYLINDER	26-091 XQ11-948	626	SCH
2	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
2	EA	FLOOR STOP	FS439	682	IVE

GROUP NO. 40

			HARDWARE BY ROLL UP DOOR MFR		
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GROUP NO. 41

2	EA	CANE BOLT	524P21	Z	CRO
1	EA	PADLOCK LESS CYL- KNK	KS43F2200	606	SCH
1	EA	HASP	712 FLAT 7" HASP	US2C	CRO
			BALANCE OF HARDWARE BY GATE FABRICATOR		

END OF SECTION

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SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior and exterior borrowed lites, storefront framing, and glazed curtain walls.
2. Glazing sealants and accessories.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 07 42 13.19 "Insulated Metal Spandrel Panels" with tempered glass exterior.
2. Section 08 35 13 "Interior Folding Glass Doors" for glazing in interior folding glass doors.
3. Section 08 43 33 "Folding Glass Storefronts" for glazing in folding glass storefronts.
4. Section 08 83 00 "Mirrors."

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
American Architectural Manufacturers Association (AAMA)
Glass Association of North America (GANA)
Insulating Glass Certification Council (IGCC)
Underwriter's Laboratories, Inc. (UL)

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product, other than clear monolithic vision glass, submit the following products; 12 inches square.
 - 1. Tinted glass.
 - 2. Laminated glass.
 - 3. Insulating glass.
- C. Glazing Accessory Samples: For gaskets, sealants and colored spacers, in 12-inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: For glass.
- C. Product Test Reports: Submit test reports from the manufacturer of the tinted glass and insulating glass demonstrating compliance with the performance requirements of this section.
- D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Glass and glazing shall conform with the 2016 CBC Title 24 Part 2 Chapter 24 - Glass and Glazing, and to Consumer Product Safety Commission regulation (CPSC) 16 CFR, Part 1201.
 - 2. Where safety glass is indicated or required, provide glazing materials that conform to ANSI Z97.1-2004 and CPSC16CFR, Part 1201 and are so identified in accordance with 2016 CBC Title 24 Part 2 Sec. 2406.2.
- B. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Do not deliver glass to the site until the areas to be glazed are ready to receive the glass. Deliver glass in manufacturers storage cases with interleaving between lights. Deliver glazing compound in manufacturer's original cartons with labels intact.
- B. Storage: Store glass in original storage cases. Store cases in a dry, well ventilated area with temperatures maintained above the dew point. Do not store glass where it will be exposed to direct sunlight.
- C. Handling: Do not unpack glass until needed for installation. Handle and install materials in a manner to prevent breakage, scratching or other damage. Keep vacuum cups free from foreign material that would scratch glass.
- D. Take special care to prevent damage to factory clean cut edges of reflective glass, and tinted glass during delivery, storage, and handling.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Clear Float Glass: Acceptable manufacturers or equal:

AGC Glass Company North America, Inc.; www.agcglass.com
 Guardian Industries Corp.; www.guardian.com
 Vitro Architectural Glass; www.vitroglass.com

Viracon, Inc.; www.viracon.com

B. Laminated Glass: Acceptable manufacturers or equal:

AGC Glass Company North America, Inc.; www.agc.com
Guardian Industries Corp.; www.guardian.com
Interpane Glas Industrie AG; www.interpane.com
Oldcastle Glass Co.; www.oldcastlebe.com
Viracon, Inc.; www.viracon.com
Vitro Architectural Glass; www.vitroglass.com

C. Insulating Glass: Acceptable manufacturers or equal:

AGC Glass Company North America, Inc.; www.agc.com
Guardian Industries Corp.; www.guardian.com
Interpane Glas Industrie AG; www.interpane.com
Oldcastle Glass Co.; www.oldcastlebe.com
Viracon, Inc.; www.viracon.com
Vitro Architectural Glass; www.vitroglass.com

D. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: Defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3, unless otherwise indicated.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3. Drawing Designation: GT-2.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS (Drawing Designation Type 3 and Type 4)

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.

2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS (Drawing Designation: Type 1)

- A. Insulating Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 2190 and with requirements specified in this Article.
 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 Performance Requirements Article.
 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated or required.
 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 4. Sealing System: Comply with requirements in Section 07 92 00 "Joint Sealants." Dual seal, with primary and secondary sealants of polyisobutylene and silicone.
 5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Aluminum with mill or clear anodic finish.
 - b. Desiccant: Molecular sieve or silica gel, or blend of both.
 - c. Corner Construction: Manufacturer's standard corner construction
- B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.

2.7 GLAZING SEALANTS

- A. General:
 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use G.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Acceptable products or approved equal:

Pecora Corp.; Extru-Seal Preshimmed Tape
Protective Treatments Inc.; PTI 303 Spacer Rod Tape
Tremco; Preshimmed 440 Tape

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: EPDM, neoprene or silicone, 70-90 Durometer (Shore A) hardness.
- D. Spacers: EPDM, neoprene or silicone, 50-60 Durometer (Shore A) hardness.
- E. Clips for Metal Surrounds: Respective surround manufacturer's standard, (steel to steel, aluminum to aluminum, etc.).
- F. Preformed Gaskets: Closed cell sponge neoprene conforming to ASTM C509 and dense neoprene wedge gaskets conforming to ASTM C864. Gaskets shall be preformed to shapes and sizes to suit the glazing stops furnished with the doors, windows, and storefront and to compress the sponge neoprene gasket 25 percent to 40 percent.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 LAMINATED GLASS SCHEDULE

- A. Laminated Glass: Clear laminated glass with two plies of fully tempered float glass. (Drawing Designation: Type 3)
 - 1. Minimum Thickness of Each Glass Ply: 3 mm.
 - 2. Interlayer Thickness: 0.030 inch.
 - 3. Safety glazing required.
- B. Acoustic Laminated Glass Basis-of-Design Product: Standard Bent Glass Corp.; 3/4" ACOUSTA-PANE® 43 Laminated Glass, or equal. (Drawing Designation: Type 4).
 - 1. Construction:
 - a. 1/4" Annealed glass.
 - b. 0.030" Polyvinyl Butyral (pvb).
 - c. 1/4" Annealed glass.
 - d. 0.030" Polyvinyl Butyral (pvb).
 - e. 1/4" Annealed glass.
 - 2. Thickness: 3/4" Nominal.
 - 3. STC Rating: 42.

3.9 INSULATED GLASS SCHEDULE (Drawing Designation: Type 1)

A. Type: Solar Control Low-E Tinted Insulating Glass.

1. "Solarban®" 60 (2) "Solexia®" + Clear by Vitro Architectural Glass
1. Outdoor Lite: "Solexia" Glass by Vitro Architectural Glass, Sputter Coated on second surface (2)
2. Tint Color: Light-green.
3. Indoor Lite: Clear (transparent) Float Glass.
4. Low-E Coating: "Solarban" 60 Solar Control (Sputtered) by Vitro Architectural Glass.
2. Location: Second Surface (2).

B. Performance Values:

1. Visible Light Transmittance: 61%.
2. U-Value Winter: 0.29
3. U-Value Summer: 0.27
4. SHGC: 0.32
5. Shading Coefficient: 0.37
6. Outdoor Visible Light Reflectance: 9%

C. Approved Manufacturers: Vitro Certified™ Fabricator Required

D. Certification: Both lites to be Cradle-to-Cradle Certified™, minimum Bronze Level, by Cradle to Cradle Product Innovation Institute (www.c2ccertified.org).

E. Outdoor Appearance: Light-green.

F. Insulating Unit Construction: 1/4" (6mm) glass + 1/2" (13mm) air space + 1/4" (6mm) glass

END OF SECTION

09/21/18

SECTION 08 83 00

MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Tempered glass mirrors qualifying as safety glazing.
- B. Related Documents: The General Construction Provisions and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 10 28 13 "Toilet Accessories" for metal-framed mirrors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Clips: Full size.
 - 3. Mirror Trim: 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of mirror and mirror mastic.
- C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Avalon Glass and Mirror Company.
 - 2. Glasswerks LA, Inc.
 - 3. Guardian Industries Corp.; SunGuard.
 - 4. Head West.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
 - 1. Nominal Thickness: 6.0 mm.

- C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
 - 3. Finish: Clear bright anodized.
- B. Aluminum J-Channels and Cleat: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch in height, respectively.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
2. Top Trim: Formed with front leg with a height matching bottom trim and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.
- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Andscot Company, Inc.
 - 2) Laurence, C. R. Co., Inc.
 - 3) Stylmark, Inc.
3. Finish: Clear bright anodized.
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished.
 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 - 1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
 - 2. Aluminum J-Channels and Cleat: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

09/21/18

SECTION 08 91 19

FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fixed, extruded-aluminum louvers.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames" for louvers in hollow-metal transom frames.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

Aluminum Association (AA)
Architectural Aluminum Manufacturers Association (AAMA)
ASTM International (ASTM)
Air Movement and Control Association International, Inc. (AMCA)

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Air flow and water entrainment performance test results.
 - 2. Material types and thickness.
 - 3. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required. For color anodized components, submit two sets of two samples each, showing the extremes in color range.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 QUALITY ASSURANCE

- A. Single subcontract responsibility: Subcontract the work to a single firm that has had not less than six years experience in the design and manufacturing of work similar to that shown and required.
- B. Performance Requirements: Provide AMCA and BSRIA test data as required to confirm that the louvers have the specified air and water performance characteristics.
- C. Warranty: Provide written warranty to the owner that all products will be free of defective materials or workmanship for a period of one year from date of installation.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: At the time of delivery all materials shall be visually inspected for damage. Any damaged boxes, crates, louver sections, etc. shall be noted on the receiving ticket and immediately reported to the shipping company and the material manufacturer.
- B. Storage:
 1. Material may be stored flat, on end or on its side.
 2. Store material indoors.
 3. Store louvers in dry locations with adequate ventilation, free from dust or water. Stack louvers off the floor.
 4. Do not cover with tarpaulins, polyethylene film or other similar coverings.
- C. Handling:
 1. Handle material in accordance with sound material handling practices and in such a way as to minimize racking.
 2. Louver sections may be hoisted by attaching straps to the jambs and lifting the section while it is in a vertical position.
 3. Louver sections should only be lifted and carried by the jambs. Heads, sills and blades are not to be used for lifting or hoisting louver sections.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 1. Construction Specialties, Inc.; www.c-sgroup.com
 2. Airolite; www.airolite.com

3. Ruskin; www.ruskin.com
4. Substitutions: Section 01 25 13 – Product Options and Substitutions.

B. Basis of Design Product: Construction Specialties, Model A4097.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B211, Alloy 6063-T5, 6063-T6 or 6061-T6.
- B. Aluminum Sheet: ASTM B3209, Alloy 1100, 3003 or 5005.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. C/S 4" Deep High Performance Drainable Fixed Extruded Mullion Louver Model A4097.

1. Material: Heads, sills, jambs and mullions to be one piece structural aluminum members with integral caulking slot and retaining beads.
2. Mullions: Sliding interlock with internal drains.
3. Blades: One piece aluminum extrusions with gutter(s) designed to catch and direct water to jamb and mullion drains.
4. Provide closed cell PVC compression gaskets between bottom of mullion or jamb and top of sill to insure leak tight connections.
5. Material thickness:
 - a. Heads, sills, jambs and mullions: 0.081".
 - b. Fixed blades 0.081".
6. AMCA Performance: A 4' x 4' unit shall conform to the following and be licensed to bear the AMCA seal:

Free Area:	8.07 sq. ft.
Free area velocity at the point of beginning water penetration:	1040 FPM
Intake Pressure drop at the point of beginning water penetration:	0.20 in. H ₂ O
Exhaust pressure drop at 1000 fpm free area velocity:	0.18 in. H ₂ O

2.4 FABRICATION, GENERAL

- A. Provide C/S louver models, bird screens, structural supports and accessories as specified and/or shown on the drawings. Materials, sizes, depths, arrangements and material thickness to be as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
- B. Mechanically assemble louvers using stainless steel or aluminum fasteners.
- C. Include supports, anchorage, and accessories required for complete assembly.
- D. Design louvers to withstand a wind load of not less than 20 pounds per square foot.

2.5 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Bird screening.
- B. Bird Screens: For aluminum louvers provide aluminum bird screen fabric in an aluminum removable, rewireable frame finished to match the louver.

1. Screens: 5/8" mesh, 0.050" thick expanded and flattened aluminum bird screen secured within 0.055" thick extruded aluminum frames. Frames to have mitered corners and corner locks.

2.6 ACCESSORIES

- A. Provide stainless steel screws and fasteners for aluminum louvers. Provide other accessories such as extra sill pieces, special flange or angle appurtenances as required for complete and proper installation.

2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

- C. Include supports, anchorages, and accessories required for complete assembly.
- D. Provide subsills made of same material as louvers for recessed louvers.
- E. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces that will be visible after completing finishing process. Provide color as indicated or, if not otherwise indicated, as selected by Architect.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of the work.
- B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.
- C. Anchor louvers to the building substructure as indicated on architectural drawings.
- D. Erection Tolerances:
 - 1. Maximum variation from plane or location shown on the approved shop drawings: 1/8" per 12 feet of length, but not exceeding 1/2" in any total building length or portion thereof (non-cumulative).
 - 2. Maximum offset from true alignment between two members abutting end to end, edge-to-edge in line or separated by less than 3": 1/16" (shop or field joints). This limiting condition shall prevail under both load and no load conditions.
- E. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.
- F. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- G. Set units level, plumb and true to line, with uniform joints. Seal around interior and exterior of frame using sealant as specified in Section 07 92 00.

3.3 PROTECTION

- A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

3.4 ADJUSTING AND CLEANING

- A. Immediately clean exposed surfaces of the louvers to remove fingerprints and dirt accumulation during the installation process. Do not let soiling remain until the final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to the material finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers and accessory components damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Architect, remove damaged materials and replace with new materials.
 - 1. Touch up minor abrasions in finishes with a compatible air-dried coating that matches the color and gloss of the factory applied coating.

END OF SECTION

09/21/18

SECTION 08 92 00

LOUVERED EQUIPMENT SCREENS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fixed, extruded-aluminum louvered roof top equipment screens, including louvered doors.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 12 00 "Structural Metal Framing" for structural framing supporting louver sections.

1.2 PERFORMANCE REQUIREMENTS

- A. Design: Design louvers, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors:
 - 1. Wind Loads: Determine loads based on a uniform pressure of 30 pounds per square foot acting inward or outward.

1.3 REFERENCES

- A. The editions of standards and specifications published by the following organizations, and referenced herein, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International
Air Movement and Control Association (AMCA)

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Indicate compliance with structural performance requirements and design criteria indicated.
- B. Shop Drawings: Submit fully detailed shop drawings giving sizes, details of fabrication and construction, methods of assembly and locations of hardware, anchors and all accessories. Make all field measurements necessary for fabrication and correct fitting of metal screens shown on drawings.

- C. Samples: Submit 12-inch long sample sections of aluminum extrusions and formed shapes showing color and finish. For color anodized components, submit two sets of two samples each, showing the extremes in color range.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store screens in dry locations with adequate ventilation, free from dust or water. Stack louvers off the floor. Do not cover with tarpaulins, polyethylene film or other similar coverings.

1.6 WARRANTY

- A. Guarantees specified herein are in addition to the general warranty and correction of work requirements of the General Conditions. The guarantees shall be signed by the coating manufacturer and the Contractor and shall be submitted in accordance with Section 01 78 36.
- B. The coating system shall be guaranteed against corrosion, cracking, peeling, chalking or color fading in excess of 10 NBS units for a period of 20 years from date of "Notice of Completion".

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet: ASTM B209-04, alloy 5052-H32.
- B. Extruded Aluminum: ASTM B221-05a, alloy 6063-T5 or T52.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
- D. Louvered Doors:
 - 1. Configuration: As shown on drawings.
 - 2. Subframe: 7" x 3" x 1/4" aluminum angle.
 - 3. Hinge: Heavy duty 0.120" thickness aluminum continuous piano hinge (0.250" pin diameter).
 - 4. Blade: 0.081" thickness type 6063-T5 extruded aluminum.
 - 5. Frame: 6" x 3" x 1/4" aluminum angle.
 - 6. Doorstop Angle: 2" x 1" x 1/8" aluminum angle.
 - 7. Designed for 100 mph wind load.
 - 8. Latch and Mounting Plate: 11 gauge Type 300 Series Stainless Steel, mill finish.
 - 9. Fasteners: 1/4-20 x 1/2" long Type 300 Series, Stainless Steel, one-way security head.
 - 10. Pivot Screw: 1/4-20 Thread, 5/16" shoulder screw with 1/2" diameter slotted head.
 - 11. Pull Handle: 1/2" round Type 300 Series Stainless Steel, (bent) with female 1/4-20 threads.
 - 12. Latch is lockable with a padlock (NIC).
 - 13. Entire latch assembly ships loose for field installation.

2.2 FABRICATION, GENERAL

- A. Join concealed frame members to each other and to fixed louver blades with fillet welds concealed from view welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 EXTRUDED ALUMINUM ROOF TOP EQUIPMENT SCREENS

- A. Horizontal Blade Louvered Roof Top Equipment Screen
 - 1. Basis-of-Design Product: Architectural Louvers Co. (Harray, LLC); www.archlouvers.com; Model V6JN4. Subject to compliance with requirements, provide the specified product or comparable product by one of the following:
 - a. Manufacturers of equivalent products submitted and approved in accordance with Section 01 25 13 - Product Options and Substitutions.
 - 2. Louver Blade Depth: 6 inches.
 - 3. Blade Spacing: 4 inch centers.
 - 4. Blade Profile: Narrow profile plain blade without center baffle.
 - 5. Blade Nominal Thickness: Not less than 0.080 inch.
 - 6. Framing Support Nominal Thickness: Not less than 0.125 inch.
 - 7. Louver Performance Requirements:
 - a. Free Area: Not less than 11.3 sq. ft. for 48-inch wide by 48-inch high louver assembly.
 - b. Horizontal Drag Coefficient: Not greater than 0.31 on a cross sectional profile, allowing for a 69% reduction in wind load imposed horizontally upon supporting structural framing.

2.4 ALUMINUM FINISH

- A. High-Performance Organic Finish:
 - 1. Before paint application, louvers shall be thoroughly cleaned and pretreated.
 - 2. Cleaning includes complete submersion in alkali cleaner, detergent deoxidization, amorphous chrome phosphate conversion coating and acidulated final rinse.
 - 3. Kynar 500® or Hylar 5000® finish shall be applied to provide 1.2 mils (30µm) factory applied, baked-on film build in accordance with AAMA 2605-13 - "Voluntary Specification Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels".
 - 4. Custom Color and Gloss: As selected by Architect from Architectural Louvers standard and custom colors.
- B. Finish exposed fasteners to match the color finish of the adjacent material.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate and place equipment screens level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.

- C. Provide perimeter reveals and openings of uniform width to allow for thermal expansion, as indicated.

3.2 CLEANING AND REPAIR

- A. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

END OF SECTION

08/27/18

SECTION 09 21 16.23

GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Gypsum board shaft wall assemblies.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For shaft wall assemblies and firestop tracks, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.
- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated.
- B. STC Rating: As indicated.
- C. Gypsum Shaftliner Board:
 - 1. Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D 3273 mold-resistance score of 10 as rated according to ASTM D 3274, **1 inch** thick, and with double beveled long edges.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Pro-Roc Moisture and Mold Resistant Shaftliner.
 - b. Continental Building Products, LLC; Mold Defense Shaftliner Type X.
 - c. Georgia-Pacific Building Products; Dens-glass Ultra Shaftliner.
 - d. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
 - e. PABCO Gypsum; Pabcore Mold Curb Shaftliner Type X.
 - f. United States Gypsum Company; Sheetrock Brand Mold Tough Gypsum Liner Panel.
 - 3. Thickness: 1 inch.
 - 4. Long Edges: Double bevel.
 - 5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C 645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.
 - 1. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.
- E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:
 - 1. Depth: 6 inches.
 - 2. Minimum Base-Metal Thickness: As indicated.
- F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
- H. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CEMCO; California Expanded Metal Products Co.

- b. Fire Trak Corp.
 - c. Steel Network, Inc. (The)
- I. Elevator-Hoistway-Entrance Struts: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.
- J. Finish Panels: Gypsum board as specified in Section 09 29 00 "Gypsum Board."
- K. Sound attenuation blankets: As specified in Section 07 21 00 "Thermal Insulation."

2.3 PANEL PRODUCTS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Acoustical Sealant: As specified in Section 07 92 00 "Joint Sealants".
- F. Gypsum Board Cants:
 - 1. Gypsum Board Panels: As specified in Section 09 29 00 "Gypsum Board."
 - 2. Adhesive: Laminate adhesive as specified in Section 09 29 00 "Gypsum Board."
 - 3. Non-Load-Bearing Steel Framing: As specified in Section 09 22 16 "Non-Structural Metal Framing."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
 - 2. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Gypsum Board Cants: At projections into shaft where indicated, install gypsum board cants covering tops of projections.
 - 1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches on center with screws fastened to shaft wall framing.
 - 2. Where non-load-bearing steel framing is required to support gypsum board cants, install framing at 24 inches on center and extend studs from the projection to shaft wall framing.
- J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

08/27/18

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Non-load-bearing steel framing systems for interior partitions, interior ceilings, and interior soffits.
2. Suspension and furring systems for interior ceilings and soffits.
3. Suspension and furring systems for exterior soffits.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; and ceiling joists.
2. Section 09 51 13 "Acoustical Panel Ceilings" for suspension systems for acoustical ceilings.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International
American Iron and Steel Institute (AISI)
ASCE 7-10
CBC Section 2506.2.1 - Other Materials.
Steel Stud Manufacturers Association (SSMA)
Steel Framing Industry Association (SFIA)
Technical Services Information Bureau (TSIB)
Western Wall and Ceiling Contractors Association (WWCCA)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Submit framing manufacturer's literature, showing tabulation of structural properties, load capacities, dimensions, metal gages and type of coating for all framing and furring members.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

- B. Evaluation Reports: For deflection/drift tracks, firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 REGULATORY REQUIREMENTS

- A. Support framing for walls and ceilings shall conform to the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 25 - Gypsum Board and Plaster. Support framing for fire resistive walls, partitions and ceilings shall also conform to CBC Title 24 Part 2 Chapter 7 - Fire-Resistance-Rated Construction, and which are listed in the current UL "Fire Resistance Directory".
- B. Furnish and install wall framing and powder driven fasteners in accordance with the framing and fastener manufacturer's current ICC Evaluation Reports.

1.6 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association, Certified Steel Stud Association, or the Steel Framing Industry Association.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the project site and store them in adequately ventilated dry locations. If it is necessary to store materials outside, stack them off the ground on a platform and fully protect them from the weather.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 MANUFACTURERS

- A. Acceptable manufacturers or equal:

Angeles Metal Systems
Allied American Studco, Inc.
CEMCO (California Expanded Metal Products Co.)
ClarkDietrich Building Systems
SCAFCO Steel Stud Company.
Steel Construction Systems.
Steel Network, Inc. (The)
Unimast, Inc.
Western Metal Lath Co.

- B. Acceptable Products: Products shall be fabricated in accordance with the SFIA (ICC-ES ESR 2457), and SSMA (ICC ESR-3064P).

2.3 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Hot-dip Zinc Coated Steel: ASTM A653, designation G60.
- C. Carbon Steel: ASTM A568. Provide framing components with electro-galvanized finish, conforming to ASTM A633, Type RS or shop-applied red-oxide, zinc chromate or other similar primer.
- D. Powder Driven Fasteners: Types and sizes indicated on the structural drawings. Acceptable manufacturers or equal:

Hilti Corp.; ICC Report ESR-2269
ITW/Ramset/Red Head; ICC Report ESR 1147
- E. Screws: No. 8 by 3/8 inch cadmium or zinc coated TEKS screws with pan heads.
- F. Concrete inserts, expansion anchors, powder driven fasteners, flange clips, and bolts for attachment of hanger wires to overhead construction shall have a rated capacity equal to that of the hanger wire.
- G. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper.

2.4 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, **G60**, hot-dip galvanized unless otherwise indicated.
- C. Steel Studs and Tracks: Fabricate framing members in accordance with ASTM C645 from hot dip zinc coated steel.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - 2. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Where indicated, provide the following:
 - 1. Slotted Top Tracks: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from vertical deflection of structure above and lateral building drift between floors; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. 16 ga. thick, to ASTM A653/A653M, Grade 50 with a minimum yield point of 50,000 psi.
 2. Length: 10'-0".
 3. 2-1/2 inch down-standing legs with 1/4 inch wide by 1-1/2 inch high slots spaced at 1 inch on center.
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. CEMCO; California Expanded Metal Products Co.; EST Exterior Slotted Track.
 - b. ClarkDietrich Building Systems; MaxTrack2D™ Slotted Deflection and drift Track.
 - c. Steel Network, Inc. (The): DriftTrack® DTSL.
- E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CEMCO; California Expanded Metal Products Co.; FAS Track.
 - b. ClarkDietrich Building Systems; BlazeFrame DSLO, MaxTrak, or SLP-TRK Slotted Deflection Track.
 - c. Sliptrack Systems; SLP-TRK Slotted Deflection Track.
 - d. Steel Network, Inc. (The): VertiTrack VT.
- F. Flat Strap and Backing Plates: Galvanized steel, not lighter than 0.0635-inch (16-gage), of proper size to accommodate fastenings.
- G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 1-1/2 inches
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Minimum Base-Steel Thickness: 0.0296 inch.
 2. Depth: 7/8 inch.

2.5 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58, or AC308 as appropriate for the substrate.
 - a. Uses: Securing hangers to structure.
 - b. Type: Torque-controlled, expansion anchor, torque-controlled, adhesive anchor, or adhesive anchor.
 - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 or Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
 - C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
 - D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
 1. Depth: 1-1/2 inches.
 - E. Furring Channels (Furring Members):
 1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Steel Thickness: 0.0296 inch.
 - F. Provide galvanized channels for exterior locations.
- 2.6 CEILING JOIST FRAMING
- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: As indicated.
 2. Flange Width: 1-5/8 inches.
 3. Section Properties: As indicated.
- 2.7 SOFFIT FRAMING
- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: As indicated.
 2. Flange Width: 1-5/8 inches, unless otherwise indicated.
 3. Section Properties: As indicated.
- 2.8 AUXILIARY MATERIALS
- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
 - B. Isolation Strip at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D226, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install slotted tracks in strict accordance with manufacturer's instructions and referenced regulation requirements, to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - a. Secure studs to slotted top track with #8 wafer-head screws. Maintain minimum deflection gap of 0.5 inch between top of stud and top of slotted track. Limit vertical movement to 1 inch, plus or minus 1/2 inch.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated. Set runners in two beads of acoustical sealant or two strips of acoustical tape as specified in Section 07 92 00.
 6. Reinforce and stiffen partitions with 3/4-inch (or larger as necessary) steel channels placed horizontally not more than 4'-6" apart. Wire-tie or bolt stiffeners to inside surfaces of studs.
- E. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers and compression posts used for support, as indicated.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 CEILING AND SOFFIT JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
1. Joist Spacing: 16 inches, unless otherwise indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.
1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
1. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 CLEAN-UP AND PROTECTION

- A. Perform clean-up of the premises as specified in Section 01 77 00.

END OF SECTION

03/22/19

ACRYLIC-MODIFIED PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes Acrylic-modified Portland Cement Plaster (stucco) and accessories for the following system:
 - 1. Exterior Stucco over gypsum sheathing on metal framing: Scratch, brown, and finish coat applied over metal lath, over weather resistant barrier, over gypsum sheathing on metal framing.
- B. Related Sections:
 - 1. Section 05 40 00 – Cold-Formed Metal Framing: Metal stud framing for cement plaster.
 - 2. Section 07 25 00 - Weather Barriers.
 - 3. Section 07 25 13 - Ventilated Rainscreen.
 - 3. Section 07 62 00 - Sheet Metal Flashing and Trim.
 - 4. Section 07 92 00 - Joint Sealants.
 - 5. Section 08 31 16 - Access Panels and Frames: Access panels in plaster work.

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 4. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - 5. ASTM C190 - ASTM C190 Method of Test for Tensile Strength of Hydraulic Cement Mortars.
 - 6. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
 - 7. ASTM C847 - Standard Specification for Metal Lath.
 - 8. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
 - 9. ASTM C933 - Standard Specification for Welded Wire Lath.
 - 10. ASTM C1032 - Standard Specification for Woven Wire Plaster Base.
 - 11. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 - 12. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
 - 13. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
 - 14. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 15. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - 16. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

- 17. ASTM E514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
- 18. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
- B. California Building Code (CBC), 2016 Edition, Title 24, Part 2, Chapter 7 and Chapter 25.
- C. Division of State Architect – Interpretation of Regulations:
 - 1. IR 25-4: Self Furring Lath.
- D. International Code Council – Evaluation Service Report:
 - 1. ICC-ES Evaluation Report ESR-2535, BMI 690 Plaster.
 - 2. ICC-ES Evaluation Report ESR-2017, Structalath No. 17 SFCR II and No. 17 SFCR Twin Trac, Structa Mega Lath, V-Truss Walls and Ceilings, Lath, and Structa-Corners Reinforcements.
- E. Manufacturer's specifications and recommendations.
- F. Stucco Manufacturer's Association; www.stuccomfgassoc.com
- G. Technical Services Information Bureau; www.tsib.org
 - 1. 2014 Plaster and Drywall Assemblies Manual.
- H. Underwriters Laboratories, Inc.
 - 1. UL (FRD) - Fire Resistance Directory.
- I. Wall and Ceiling Alliance (WACA); www.wallandceilingalliance.org
- J. Western Wall and Ceiling Contractors Association; www.wwcca.org

1.03 PRE-INSTALLATION MEETING

- A. Pre-Installation Meeting:
 - 1. Convene meeting at Project Site within one week of scheduled start of application with representatives of the following in attendance: Owner or Owner's designated representative, Architect, Contractor, sub-contractor and manufacturer's representative.
 - 2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures and protection measures.

1.04 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Extend complete plaster assembly behind surface installed fixtures and trim.
 - 2. Water resistive barrier and ventilated rainscreen beneath lath at all locations (except no ventilated rainscreen at horizontal locations).
- B. Products provided under this section shall exhibit the following characteristics when tested as follows:
 - 1. ASTM C 109: Compressive Strength: 2020 psi.
 - 2. ASTM C 348: Flexural Strength: 570 psi.
 - 3. ASTM C 190: Tensile Strength: 180 psi.
 - 4. ICC Procedure: Freeze/Thaw cycling: No cracking, checking or delamination
 - 5. ASTM E 72: Transverse Load Strength: Wood Studs – 96 psf; Metal Studs – 138 psi.
 - 6. ASTM E 514: Water Vapor Permeability: 7.2 Perms.

7. ASTM E 119: Fire Resistive Wall Assembly, acceptable as part of One-Hour Assembly.
 8. MIL STD 810B: Mildew Fungus Resistance – Passed.
 9. ASTM B 117: Salt Spray Resistance – 300 hrs, no deleterious effects.
 10. ASTM D 968: Abrasion Resistance – 132 gal, no deleterious effects.
 11. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 12. ASTM G155: Accelerated Weathering – 5000 hrs, Passed.
- C. Performance Requirements:
1. Finish surfaces flat, true, and plumb to plus or minus 1/8-inch in 10 feet.
 2. Provide weather tight assembly.

1.05 ACTION SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures, for submittals procedures.
- B. Product Data: For each type of product. Provide data on plaster materials, accessories, characteristics and limitations of products specified. Include mix design for each coat.
- C. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.
- D. Samples: Submit two samples, 12 x 12 inch in size illustrating each factory-prepared finish coat and for each color and texture specified. Provide color samples of sealants. Provide physical samples of each type of fastener and anchorage.
- E. Sample Warranty: For manufacturer's special warranties.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C 926.
- B. Regulatory Requirements: Plaster construction shall meet the requirements of the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 25 - Gypsum Board and Plaster:
 1. Section 2507 – Lathing and Plastering.
 2. Section 2510 – Lathing and Furring for Cement Plaster (Stucco).
 3. Section 2512 – Exterior Plaster.
- C. Conform to 2016 California Building Code (CBC) Title 24 Part 2, Chapter 7 – Fire Resistance Requirements for Plaster. Rated Construction for fire rated assemblies as indicated on drawings.
- D. Allowable Tolerances: Finish all plaster surfaces to true and even plane within tolerance of 1/8-inch in 10 feet inch as measured by a straightedge placed at any location on surface.
- E. Manufacturer Qualifications: Company specializing in manufacturing the products of this section with minimum five (5) years of documented experience.
- F. Applicator Qualifications: Installer shall be listed with Acrylic-Modified Portland Cement Plaster Systems Manufacturer as a trained applicator and shall possess a

current Manufacturer-trained contractor certificate.

- G. Field mixed plaster systems not permitted.

1.07 MOCK-UP

- A. Section 01 45 00 – Quality Control: Requirements for mockups.
- B. Before proceeding with installation of cement plaster work, prepare a mock-up. The mock-up shall include flashings, cement plaster accessories, reveals, corner bead, casing beads, control joints and complete plaster base coats including proposed finishes.
- C. Provide mock-up with a minimum area of 100 square feet.
 - 1. Install mockups for each type of finish indicated.
 - 2. Locate where directed.
- D. Make such modifications as necessary to achieve a satisfactory mock-up, or remove and construct additional mock-up. Unacceptable work shall be removed.
- E. Retain accepted mock-up as quality standard for acceptance of completed work. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Deviations from the final, approved mock-up are not permitted unless approved by the Architect. The Architect reserves the right to reject any or all deviations from the approved mock-up.

1.08 DELIVERY, STORAGE AND HANDLING

- A. In accordance with the manufacturer's recommendations.
- B. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
- C. Immediately remove from site all materials which have been delivered in broken, damaged, or unlabeled condition.
- D. Protect materials from dampness.
- E. Store materials indoor, off floor.

1.09 FIELD CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Application of materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are dry.
 - 2. Protect the materials from uneven and excessive evaporation in warm windy weather. Always work the shady side of the wall.

3. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 4. Apply plaster when ambient temperature is greater than 40 deg F.
 5. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

1.10 WARRANTY

- A. Section 01 78 36 – Warranties: Requirements for warranties.
- B. Furnish manufacturer's 15-year Single Source Warranty encompassing the work of this Section. Assist the Owner to properly execute the warranty request forms.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturers:
 1. BMI Products; www.bmi-products.com, 990 Ames Avenue, Milpitas, CA 95035-6303, (408) 293-4008; Local Representative: Joao Esteves, BMI Sika Corporation; Mobile: +1 949 613 4641; esteves.joao@us.sika.com
 2. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Product Description and Basis of Design: BMI 690 Plaster, ICC-ES Evaluation Report ESR-2535; a premixed scratch and brown coat, a complete ASTM C926 mix, just add water.

2.02 PREMIXED and ENGINEERED PLASTER MATERIALS

- A. Plaster Base Coat: "BMI 690 Plaster": A premium pre-blended cement-lime-sand mixture, with fiber that has been specially formulated for the scratch and brown coat. This pre-blended product assures consistent quality throughout the project. Available in: Sacks, superbags, or environmentally-friendly silo/mixer.
- B. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.
- C. Leveling Coat/Lamina: Apply in thin layer over Portland Cement Plaster Base Coat to embed reinforcing mesh and provide uniform substrate for finish application.
 1. BMI 777 high performance, fiber-reinforced, polymer-modified basecoat 1/8" nominal.
- D. Reinforcing Mesh: ASTM C-1116, BMI Standard Reinforcing Mesh: Specially woven, alkali-resistant glass fiber reinforcing mesh, 4.5 oz/ sq. yd. with integral compatibility treatment for related materials.
- E. Primer: 100% BMI acrylic color primer: Water-based, pigmented acrylic primer applied over the cured plaster base coat, minimum 7 days, to improve adhesion and provide more uniform finish appearance.
- F. Finish: 100% acrylic finishes/coatings with integral color and texture. Multiple color(s)

as selected by Architect as indicated on exterior elevations:

1. Acceptable manufacturer: BMI Products Inc.
2. Other equivalent manufacturers accepted under substitution request per Section 01 25 13 – Product Options and Substitutions.
3. Texture: As selected by Architect from manufacturer's standard textures.

G. Warranties available with BMI 690 Plaster basecoats:

1. BMI 100% acrylic finish of 7-10 years.
2. Single Source Warranty from BMI Products to the Owner for 15 years (basecoats, lamina, primer, acrylic finish).
3. Other manufacturers of equal quality and single source warranty acceptable under substitution request.

2.03 METAL LATH

- A. Weather-Resistive Barrier: Water resistive barrier as specified in Section 07 25 00.
- B. Ventilated Rainscreen: As specified in Section 07 25 13.
- C. Flexible Flashing: Waterproofing Barrier beneath exposed horizontal exterior Portland cement covered surfaces. ASTM D 1970 and the following:
1. Self-adhering, butyl-rubber based water-resistive flashing membrane as specified in Section 07 25 00.
- D. Lath:
1. Sheathed stud walls: Structa Welded Wire Lath – ASTM C 933.
 - a. Structa Wire Corp; www.structawire.com; Structa Mega Lath:
 - 1) Weight 1.95 lb/yd².
 - 2) Finish – Class 1 Galvanized Coating complying with ASTM A641.
 - 3) Alternate lath to 3.4 lb/yd² diamond mesh metal lath specified in ASTM C847.
 - 4) As per ICC ESR-2017.
- E. Anchorage: Nails, staples, or other metal supports conforming to requirements of referenced standards, of type and size to suit application and conforming to requirements of CBC Table 2507.2 for conditions indicated, galvanized, to rigidly secure lath and associated metal accessories in place.
1. Screws: Wafer head "lathers" Type S with length that penetrates into wood framing 5/8 inch. Comply with ASTM C1002 and/or ASTM C954.
 2. Nails: Galvanized 11 gage with a 3/8-inch diameter head and a length to penetrate wood framing (exclusive of sheathing) minimum 3/4-inch. Comply with FS FF-N-105.
 3. Staples: Galvanized 16 gauge with a minimum 3/4-inch crown and legs that penetrate wood framing (exclusive of sheathing) minimum 3/4-inch. Comply with FS FF-N-105.

2.04 ACCESSORIES

- A. General: Comply with ASTM C1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required. Galvanized steel, unless otherwise specified.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Structa Wire Corp.
 2. CEMCO.
 3. ClarkDietrich Building Systems.
 4. Phillips Manufacturing Co.
- C. Reinforcement:
1. Interior Corners: No. 30.
 2. Exterior Corners: Structa Wire Corp; www.structawire.com; Structa Welded Wire Lath – ASTM C933:
 - a. V Truss Corners – Exterior Corner Reinforcements:
 - 1) Available in Straight, Bullnose, Arch & One Coat profiles.
 - 2) Finish – Class 1 Galvanized Coating complying with ASTM A641.
 - 3) As per ICC ESR-2017.
- D. Screeds and Molds: Per TSIB Plaster Systems Manual, size and profile as indicated on the Drawings and as necessary to suit application.
1. 22 gauge galvanized steel. Hem exposed edges. Furnish in longest possible lengths.
 2. Furnish drip screeds with weep holes every 2-inches.
 3. #7 Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
 4. J-Series Casing Bead: Cemco Water Management Products, J-Series Casing Bead.
 - a. Manufactured non-perforated to enable the casing bead to have solid flashing capabilities.
 - b. Fabricated from minimum 0.018-inch thick hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A925.
 5. #3 Flashing Screed: Cemco Water Management Products, #3 Flashing Screed.
 - a. #3 Flashing Screed consists of a combined single piece 45 degree weep screed, for drainage, and a Z flashing for window head protection. Available with or without weep holes.
 - b. Fabricated from minimum 0.018-inch thick hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A925.
 6. #6 Drip Head: Cemco Water Management Products, #6 Drip Head.
 - a. For application above windows, doors, and louvers on exterior plaster walls. The 45 degree slope allows water to weep out of the assembly, and the 90 degree return provides a 3/4-inch solid metal leg for sealant application from stucco assembly to dissimilar metals.
 - b. Fabricated from minimum 0.018-inch thick hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A925.
 7. #12 Soffit Drip Edge: Cemco Water Management Products, #12 Soffit Drip Edge.
 - a. Manufactured for soffit and recessed window head application.
 - b. The 45 degree slope allows water to weep out of the assembly. The drip edge provides a place for water to drip from rather than travel back along the edge.
 - c. Fabricated from minimum 0.018-inch thick hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A925.
 8. #17 Base Flashing: Cemco Water Management Products, #17 Base Flashing.
 - a. Manufactured for application at base of stucco assembly to dissimilar materials.
 - b. The 45 degree slope combined with weep holes allows water to

weep out of the assembly and the counter flashing leg provides protection to dissimilar materials.

- c. Fabricated from minimum 0.018-inch thick premium hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A925.

E. Expansion and Control Joints:

- 1. Vertical Joints:
 - a. Control Joints: Keene #C-J Series. Size and location as noted on Drawings.
 - b. Expansion Joints: No. 40; Size and location as noted on Drawings.
- 2. Horizontal Control Joints: Cemco Water Management Products, No. 15 Solid Leg Control Joint; Size and location as noted on Drawings.
 - a. 5-1/2" x 3/4" horizontal control joint has a 3" long upper solid flange that allows for water to weep out of the stucco cavity and a 1.5" long lower expanded metal flange that allows proper keying of plaster.
 - b. Fabricated from minimum 0.018-inch thick hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A924.
- 3. M-Slide Expansion Joint: Cemco Water Management Products, M-Slide Expansion Joint.
 - a. Self-aligning two-piece design allows for 1-inch vertical movement while maintaining a watertight assembly for plaster walls.
 - b. Fabricated from minimum 0.018-inch thick hot-dipped galvanized steel complying with ASTM A653 having a minimum G90 coating complying with ASTM A925.

- B. Stucco Reglet and Counterflashing Assembly: As specified in Section 07 62 00.

2.06 SEALANT

- A. "Spectrum 3" or "Spectrum 4" low-modulus silicon sealant, as manufactured by Tremco, Inc., type as recommended by wall finish manufacturer for conditions indicated, and as required to maintain single-source warranty continuity.
 - 1. Color: As selected by Architect from manufacturer's standards.

2.07 PLASTER MIXES

- A. Plaster Base Coat: "BMI 690 Base": A premium pre-blended cement-lime-sand mixture, with fiber that has been specially formulated for the scratch and brown coat. This pre-blended product assures consistent quality throughout the project. The pre-blended product can be mixed in a continuous mixer as well as a mechanical plaster mixer, or environmentally-friendly silo.
- B. Mix for three minutes, but never more than five minutes. DO NOT OVERMIX.
- C. Alternative method of application is the double-back method and is acceptable.
- D. Protect mixtures from freezing, frost, contamination, and excessive evaporation.
- E. Do not re-temper mixes after initial set has occurred.
- F. For Type I, II, III, IV, and V-A construction, (non-combustible walls), BMI 690 Plaster has been independently tested and complies with ASTM E136 non-combustible construction. BMI 690 Plaster will not aid combustion or add appreciable heat to an ambient fire, and thereby complies with requirements for non-combustible construction. The matter of application in a conventional scratch and brown coat,

double-back, or single pass method on the walls; is a moot issue.

- G. Factory-Prepared Finish-Coat Mixes: "BMI Acrylic Finish", texture as selected by Architect, pre-blended using ingredients meeting ASTM requirements. For acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Mechanical and Electrical: Verify services within walls have been tested and accepted.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.03 INSTALLATION, GENERAL

- A. General: Install in accordance with all Reference Standards.
- B. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.
- C. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.
- D. Extend complete plaster assembly behind surface installed fixtures and trim.

3.04 INSTALLING WATER RESISTIVE BARRIER AND FLASHINGS.

- A. Install in accordance with referenced standards. Fasten securely in place.
- B. Water Resistive Barrier and Flashings:
 - 1. Cover surfaces of wall framing under exterior plaster with water resistive barrier, without holes, tears, or gaps. Apply water resistive barrier as a separate layer. Secure end laps at supports.
 - 2. Install water resistive barrier continuously behind applied accessories.
 - 3. Lap horizontal edges 4-inches minimum, shingle fashion to weather.
 - 4. Lap vertical edges 6-inches minimum and seal with tape.
 - 5. Double bottom layer at corners, extending 6-inches around corner from each side.
 - 6. Lap sheet metal flashings. Lap felt flashing strips at door frames and

- windows; lap over head and jamb strips and under sill strip.
7. Extend no part of metal lath under water resistive barrier or flashing. Weather all laps to exterior.
- C. Ventilated Rainscreen: Install per Section 07 25 13.
- D. Flexible Flashing: Install in locations indicated and underlying horizontal and sloped areas of plaster, in inset wall opening sills and similar locations; in accordance with the manufacturer's recommendations and as follows;
1. Substrate Preparation:
 - a. Smooth, clean, dry and free of voids, spalled areas, loose substrate, loose nails, sharp protrusions or other matter that will hinder the adhesion or regularity of installation.
 - b. Clean loose dust or dirt by wiping with a clean dry cloth or brush. Prime the substrate with compatible primer in conditions recommended by flashing manufacturer.
 2. Flashing Application:
 - a. Coordinate installation with other water resistive barrier and metal flashings, interleave as required to weather all laps to drain, directing water to exterior.
 - b. Peel release paper from roll to expose rubberized asphalt and position flashing to center over joint location before application. Ensure flashing is centered over joint opening. Avoid fishmouths.
 - c. Press flashing firmly into place, ensure continuous and intimate contact with the substrate. Cut out wrinkles or other affected areas and replace.
 - d. Flashing shall be continuously supported by the substrate without spanning or bridging joints, gaps or voids in excess of 1/4 inch. Minimum End Laps 2 inch.
 3. Install metal lath over flexible flashing.

3.05 INSTALLING ACCESSORIES

- A. General: Install according to ASTM C1063 and at locations indicated on Drawings.
- B. Set straight, plumb and level, and shim as required to proper grounds. Coordinate, trim or cope screeds and accessories to lap, or be lapped with flashings and work provided by other sections. Ensure all laps of accessories and flashings weather to exterior.
- C. Neatly miter or cope, corners and intersections of accessories to fit exposed edges. Make tight hairline joints.
- D. Lap and caulk drip screeds and other exterior accessories at joints and intersections.
- E. Continuously reinforce angles and fasten only at perimeter edges.
- F. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- G. Control Joints: Install control joints at locations indicated on Drawings.
1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft.
 - b. Horizontal and other Nonvertical Surfaces: 100 sq. ft.
 2. At distances between control joints of not greater than 18 feet on center.
 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.

4. Where control joints occur in surface of construction directly behind plaster.
 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
 6. Wire tie control joints to the lath, and do not screw down with the same fasteners used for the lath.
- H. Extend screeds and accessories into niches and recesses, around interior and exterior wall corners, and around all sides of columns and similar building elements. Continue control joint patterns and molding alignments on walls of arcades, passages and all similar locations to match or extend those shown on exterior elevations, whether or not individual conditions are specifically shown, noted or elevated.
- I. Lap and caulk cement plaster screeds and other accessories at all joints, comers and intersections to make weathertight.

3.06 INSTALLING METAL LATH

- A. Installation of Structa Mega Lath:
1. Install as per ESR 2017.
 2. Fastener type and spacing as per ASTM C 1063 except that fasteners may attach to the lath to framing supports either at the furring crimps on the vertical cross wire, at the intersection of the longitudinal wire and cross wire, or any point along longitudinal wire.
 3. Mega Lath is designed for nail or screw or staple fastening points to coincide with the longitudinal Twin Trac wires.
 4. Lath shall not be continuous through control joints, but shall be stopped and tied at each side as required by ASTM C1063.
 5. For alternative installations for 1.4 lb/yd² woven wire or to 3.4 lb/yd² diamond mesh metal lath the maximum spacing must be in accordance with Table 3 of ASTM C 1063.
 6. Mega Lath is approved for 24" on center and is to be lapped one mesh.
 7. Refer to current manufacturer's instructions posted @ <http://www.structawire.com>
- B. Reinforce internal and external corners with lath:
1. Continuously reinforce internal angles with corner mesh, return metal lath 3-inches from corner to form the angle reinforcement; Fasten only at perimeter edges.
- C. Apply strip reinforcement diagonally at corners of lathed openings. Secure rigidly in place.
- D. Place 4-inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

3.07 PLASTER APPLICATION

- A. General: Comply with ASTM C 926. Apply BMI 690 premixed plaster in accordance with manufacturer's written instructions.
1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free

- from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Three-Coat Application over Metal Lath:
1. Apply first coat to a nominal thickness of 3/8 inch. Apply plaster scratch coat to embed lath completely so that no lath is visible. Scratch or score vertical surfaces horizontally at even intervals for mechanical key.
 2. Apply second coat to a nominal thickness of 3/8 inch once the first coat is sufficiently rigid to accept the application without being disturbed. Apply evenly, using a rod, darby or other straightedge, bring surface to a true, even plane, flush with plaster grounds.
 3. Float surface with a wood or hard rubber float to promote densification and ensure a surface with adequate "tooth" receptive to bonding of the finish coat.
 4. Apply acrylic primer and finish coat to a nominal thickness of 1/8 inch. Apply evenly over brown coat and 7 days after application of preceding coat.
- C. Curing: Base requires adequate moisture to allow continuous hydration of the cement.
1. Minimum two (2) days of moist curing shall be provided.
 2. Provide additional moist curing to conform to code requirements, manufacturer recommendations, local practices and climatic conditions and as otherwise required to provide acceptable substrate for finish coat.
 3. Base coat shall be allowed to cure for a minimum of 7 days prior to coating with acrylic primer and Finish.
- D. Reinforced Leveling Coat:
1. Ensure that the surface of the wall is cured, clean, dry and free of efflorescence, oil or other contaminants that would impair adhesion.
 2. Apply mixture in continuous layer approximately 3/32 inch thick.
 3. Apply a layer of reinforcing mesh into the wet mixture and trowel smooth until mesh is fully embedded. Lap adjoining pieces of mesh 2-1/2 inches minimum and as described in the manufacturer's written instructions and technical bulletins.
 4. Cure for a minimum of 24 hours, until dry, or longer as required by weather conditions.
- E. Primer Application: Colored Primer;
1. Ensure that the surface of the wall is cured, clean, dry and free of efflorescence, oil or other contaminants that would impair adhesion.
 2. Primer color shall closely match that of the selected finish.
 3. Stir to a smooth homogeneous consistency and apply to the wall using a roller, brush or airless spray equipment. Refer to published Colored Primer data sheet for more complete instructions.
 4. Allow to completely dry.
- F. 100% Acrylic Textured Finish Application:
1. Ensure that the surface of the wall is clean, dry and free of any contaminants that may impair the adhesion of surface finish.
 2. Spray, or trowel-apply textured finish to dried primer.
 3. Apply finish to natural breaks to avoid visible cold joints.
 4. Always work the shady side of the wall or provide temporary shading to avoid application in direct sunlight.
 5. Apply in accordance with manufacturer directions for the specific finish and texture being used.

3.08 FIELD QUALITY CONTROL

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet. No "eye-catching" discrepancies shall be allowed. Refer to TSIB Technical Bulletin 60-100 "Procedures for Judging Finished Portland Cement Plaster".
- B. Avoid performing work that will result in patching.
- C. In the event of a dispute over quality or an installation, the Architect shall call on the TSIB. Contractor agrees to abide by TSIB decision for repair, alteration, or remedy.

3.09 PLASTER REPAIRS - PATCHING OF FIRST AND SECOND COATS

- A. General: Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.
- B. Cut out, remove, and repair cracks and spalled cement plaster surfaces as specified herein. This work shall include all 1/32-inch and wider cracks.
 - 1. Removal of existing plaster:
 - a. Carefully remove soft, broken, or loose plaster back to lath and to solid adjacent plaster. The edges shall be straight, clean, sharp, and beveled inward to permit keying repairs into existing cement plaster.
 - b. Remove unsound plaster. If base coat is sound remove only finish coats.
 - c. Open small cracks slightly using a knife or chisel to remove the existing cement plaster. Enlarge large cracks with a saw. Make sawcuts perpendicular to the surface. Do not further enlarge large cracks except as required to remove soft, broken, or loose materials, and as may be required to correct defective substrates.
 - d. Remove plaster coats in step fashion so that each new coat will overlap the underlying existing plaster coat.
 - e. For cracks less than 1/8-inch wide into which a thin knife blade can be inserted, remove loose material as described herein and patch using 1 part portland cement to 2-1/2 parts fine (100 percent passing a 30 mesh screen) silica sand aggregate with an admixture added. Build patches up in layers using a stiff mix. Finish off flush with surrounding surface and match adjacent texture.
 - 2. Remove all traces of dirt, oil, grease, and other foreign matter before installing new lath and plaster.
 - 3. Apply bonding agent in accordance with manufacturer's directions and as recommended in the Portland Cement Association's publication "Bonding Concrete or Plaster to Concrete".
 - 4. Install new cement plaster as specified herein. Wetting of adjacent existing plaster surfaces is required prior to installing new portland cement plaster. Build up new portland cement plaster patches in coats. Apply each coat about 1/4- inch thick and allow to cure properly before applying succeeding coat.
 - 5. The total thickness of the portland cement plaster patch shall match that of the existing adjacent finish.

3.10 CLEANING

- A. Section 01 77 00 – Contract Closeout and Final Cleaning: Requirements for cleaning.

- B. Clean installed surfaces in accordance with manufacturer's instructions; do not clean surfaces with products not specified in manufacturer's instructions. Clean as work progresses, remove residue without delay.
- C. Protect metal surfaces and plumbing fixtures. Flush surfaces with clean water before and after cleaning.

3.11 PROTECTION

- A. Protect finished work from damage until acceptance by Owner.
- B. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

09/21/18

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum sheathing.
3. Accessories.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 07 21 00 "Thermal Insulation" for acoustical insulation.
2. Section 07 84 13 "Penetration Firestopping" for penetration identification signage on gypsum board partitions.
3. Section 07 84 43 "Joint Firestopping" for joint identification signage on gypsum board partitions.
4. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
5. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
6. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.
7. Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing" for glass-mat, water-resistant gypsum substrate boards.
5. Section 09 91 00 "Painting" for coordination of gypsum board finish levels with specified paint systems.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)
Gypsum Association (GA)
Technical Services Information Bureau (TSIB); formerly Western Lath/ Plaster/
Drywall/ Industries Association (WLPDIA)
Western Wall and Ceiling Contractors Association (WWCCA)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Certificates: Submit manufacturer's certification that products meet or exceed requirements of the referenced specifications.

- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Gypsum Board Construction: Meet the requirements of the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 25 - Gypsum Board and Plaster.
- B. Regulatory Requirements: The quantity of volatile organic compounds (VOC) used in adhesives and sealants shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District, and South Coast Air Quality Management District.
- C. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations on walls and ceilings.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver gypsum board and accessories in the manufacturer's original unopened containers, bundles or rolls bearing the manufacturer's name and brand designation.
- B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.
- C. Store flammable adhesives away from fire, sparks and smoking areas.
- D. Handle gypsum board to prevent damage to edges, ends, and surfaces.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not apply gypsum board until insulation, pipes, conduits, ducts, vents, supports and other items that will be concealed by the gypsum board have been inspected, tested and approved by the governing authorities and unsatisfactory conditions have been corrected.
- C. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- D. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistive Construction: Meet the requirements of CBC Title 24 Part 2 Chapter 7 - Fire and Smoke Protection Features and Chapter 8 - Interior Finishes.
 1. Fire-Resistance-Rated Assemblies: Provide fire-resistance rated assemblies identical to those in Chapter 7 of the CBC Title 24 Part 2 or in listing of other testing agencies acceptable to the State Fire Marshal.
 2. Fire Performance Characteristics: Provide finish materials meeting requirements of Chapter 8 Section 803 of the CBC Title 24 Part 2 and that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal, indicating the following fire performance characteristics tested in accordance with ASTM E84.
 - a. Flame Spread: Not more than 25.
 - b. Smoke Developed: Not more than 50.
- B. Fire Resistive Gypsum Board: Bear the Underwriter's Laboratories Inc. (UL) label or label of another organization acceptable to the State Fire Marshal.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- D. Regulatory Requirements: Per CBC Sec. 703.7, provide marking and identification for fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions, or any other wall required to have protected openings or penetrations. Marking and identification shall be effectively and permanently identified with signs or stenciling.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide in maximum 4 foot widths and maximum lengths available that will minimize joints in each area and that correspond with support system indicated.

2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Georgia-Pacific Gypsum LLC: www.gp.com
 Continental Building Products, LLC.; www.continental-bp.com
 CertainTeed Corporation; www.certainteed.com
 National Gypsum Company; Gold Bond Building Products Division;
www.nationalgypsum.com
 USG Corporation; www.usg.com
 PABCO Gypsum; www.pabcogypsum.com

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396: 5/8 in. thick unless otherwise shown or specified, with tapered edges and either rounded or beveled returns for prefilling. Where fire resistive ratings are shown use thickness required to comply with assembly fire testing of gypsum board partitions for fire rating required.

1. Acceptable products:

- a. USG Corporation Sheetrock Brand EcoSmart Firecode X panels; or equal.

- 1) As compared to the net use of fresh water value of 1.329 m³/1000 ft² in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a 25% or greater reduction in net use of fresh water value or a net use of fresh water value less than or equal to 1.0 m³/1000 ft² for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.
- 2) As compared to the global warming potential value of 317.4 kg CO₂-eq./1000 ft² in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a 21% or greater reduction in global warming potential or a global warming potential value of less than or equal to 232 kg CO₂-eq./1000 ft² for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.
- 3) As compared to the primary energy from non-renewable resources value of 5,291 MJ/1000ft² in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a primary energy from non-renewable resources value less than or equal to 3,986 MJ/1000 ft² for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.

- b. G-P Gypsum Corp.; or equal.
- c. National Gypsum Company; or equal.
- d. CertainTeed Corporation; or equal.

- B. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396, 5/8 in. thick "Type X" unless otherwise shown or specified, with tapered edges and either rounded or beveled returns for prefilling. Where fire resistive ratings are shown use thickness required to comply with assembly fire testing of gypsum board partitions for fire rating required.

1. Acceptable products:

- a. United States Gypsum Co.; Sheetrock Brand EcoSmart Mold Tough Firecode X Panels, or equal.

- 1) Wallboard uses a manufacturing process with a net use of fresh water value less than or equal to 1.35 m³/1000 ft² for wallboard manufactured west of the Mississippi River as listed per Product Category Rules for North American Gypsum Boards.
- 2) Wallboard uses a manufacturing process with a global warming potential value of less than or equal to 268 kg CO₂-eq./1000 ft² for wallboard manufactured west of the Mississippi River as listed per Product Category Rules for North American Gypsum Boards.

- b. CertainTeed Gypsum; M2Tech® gypsum board, or equal.
 - c. G-P Gypsum Corp.; Mold-Guard Gypsum Board, or equal.
 - d. National Gypsum Company; Gold Bond Brand XP Fire-Shield Gypsum Board, or equal.
- C. Impact-Resistant Gypsum Board: ASTM C1396 gypsum board, tested according to ASTM C1629.
 - 1. Core: 5/8 inch, Type X.
 - 2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 to Level 3 requirements.
 - 3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
 - 4. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 to Level 3 requirements.
 - 5. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 to Level 3 requirements according to test in Annex A1.
 - 6. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
 - 4. Acceptable products or equal:

CertainTeed Corporation; AirRenew Extreme Impact
 G-P Gypsum Corp.; DensArmor Plus
 National Gypsum Company; Gold Bond Hi-Impact Wallboard
 United States Gypsum Co.; Sheetrock Brand VHI

2.5 EXTERIOR GYPSUM SHEATHING

- A. Glass-Mat Gypsum Sheathing Board: ASTM C1177, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
 - 1. Core: Mold-resistant, 1/2 inch.
 - 2. Acceptable products or equal:

G-P Gypsum Corp.; Dens-Glass Gold.
 National Gypsum Company; Gold Bond, e(2)XP.
 USG Corporation.; Securerock Glass Mat Sheathing.
 CertainTeed Corporation; GlasRoc Sheathing.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Paper-faced galvanized-steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C 1047.
 - 1. Material: Hot-dip galvanized-steel sheet.

2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound; drying-type, all-purpose compound; or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Exterior Applications:
 1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Acceptable products or equal:

- a. OSI® F38 Drywall and Panel Adhesive; www.ositough.com
 - b. Liquid Nails DWP Drywall Construction Adhesive; www.liquidnails.com
 - c. Franklin International; Titebond Professional Drywall Adhesive; www.titebond.com
- C. Screws: Conform to the standards specified below for attaching gypsum board to the various substrates listed.
- 1. Steel Drill Screws for Metal Framing, 20-Gage and Heavier: ASTM C954.
 - 2. Steel Drill Screws for Metal Framing and Furring, 25-Gage: ASTM C1002, Type S.
 - 3. Wood Framing: ASTM C1002, Type W.
 - 4. Gypsum Backing Board: ASTM C1002, Type G.
- D. Nails for Attaching Gypsum Board to Wood Framing: ASTM C514.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
- 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.
- F. Resilient Channels: As specified in Section 09 22 16.
- G. Acoustical Sealant: As specified in Section 07 92 00.
- H. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation".
- I. Sound Attenuation Blankets: As specified in Section 07 21 00 "Thermal Insulation".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine framing to ensure that corners and framing are plumb, true and solid and that framing members are properly spaced. Edges and ends of board shall have solid bearing.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. General: Comply with ASTM C840.

- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Use fire retardant, moisture- and mold-resistant gypsum board on walls within toilet rooms, and elsewhere as indicated.
 - 2. Use fire retardant backing board or fire retardant gypsum board for base layer for 2 layer applications.
 - 3. Use proprietary, special fire-resistive gypsum board where indicated or required to achieve specific fire-resistance-rated assembly.
 - 4. Use impact-resistant gypsum board where indicated.

5. Use fire retardant gypsum board in all locations not otherwise indicated or specified.
- B. Fastening: Locate fasteners not less than 3/8-inch or more than 1/2-inch from edges and ends of gypsum board. Drive fasteners perpendicular to the gypsum board surface with heads set slightly below the gypsum board surface for finish layers and even with the surface for base layers. Attach gypsum board starting from the center of each panel and proceeding toward the outer edges. Fasten gypsum board in place with screws over metal framing and with nails or screws over wood framing.
- C. STC-Rated Assemblies: Where sound rated partitions are indicated, seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Acoustical sealant specified in Section 07 92 00. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- D. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- E. Nonrated Single Layer Construction:
1. Apply gypsum board with the long dimension at right angles to ceiling framing and at right angles or parallel to wall framing members. Use maximum-length panels to minimize end joints.
 2. Apply ceiling panels before wall/partition board application to the greatest extent possible.
 3. Attach gypsum board with screws spaced 12-inches on center for ceilings and walls. Use 1-inch long screws for metal framing and furring.
- F. Nonrated Double Layer Construction: Provide one of the following methods at the Contractor's option.
1. Mechanically Fastened Face Layer: Apply base layer with the long dimension at right angles to the framing members. Attach the base layer with screws spaced 24-inches on center. Use 1-inch long screws for metal framing. Apply face layer with long dimension at right angles to the base layer. Attach the face layer with screws 24-inches on center. Use 1-5/8 inch long screws.
 2. Adhesive Applied Face Layer: Apply base layer with the long dimension at right angles to the framing members. Attach the base layer with screws of sizes and spacings as specified for single layer construction. Apply the face layer with long dimension perpendicular to the base layer. Laminate the face layer to the base layer with all-purpose joint compound applied to the back of the panel with a notched spreader. Hold the face layer in position until adequate bond is achieved using temporary fasteners or bracing. Remove temporary fasteners or bracing and fill all holes with joint compound as specified herein.
- G. Rated Fire Resistive Partitions: Install and fasten gypsum board in accordance with CBC
- H. Edge Sealing: Cut edges, utility holes, and joints of water resistant gypsum board shall be treated with the gypsum board manufacturer's recommended waterproof sealant before installation.
- I. Tolerances: Gypsum board surfaces shall have a maximum variation of 1/8-inch in 10-feet when a straight edge is laid on the surface in any direction and no measurable variation in any 2-foot direction.

- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- K. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on the drawings. If no control joints are indicated, provide joints according to ACTM C 840 to ensure that unbroken wall surfaces are limited to 30-feet in length and unbroken ceiling surfaces are limited to 2500 square feet or 50-feet in either direction.
- C. Interior Trim: Install in the following locations:

1. Cornerbead: Use where indicated at vertical and horizontal outside corners and angles.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where panels terminate against adjacent materials.
 4. U-Bead: Use at exposed panel edges where indicated.
 5. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Attach corner and edge trim and control joints with screws spaced not more than 9-inches on center. Install in the following locations:
1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Tape and finish joints, corners, fastener heads, and other imperfections in accordance with the manufacturer's specifications and recommendations to provide a smooth finish.
- E. Reinforce joints, wall and ceiling angles, and inside vertical corners with tape embedded in joint compound. Finish joints with not less than 2 applications of joint compound, allowing each application to dry thoroughly and sanding between coats as required.
- F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840.
1. Level 1: Provide for ceiling plenum areas and concealed areas, and surfaces receiving fabric-covered tackboard paneling, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies. Where Level 1 gypsum board finish is indicated or specified, apply embedding coat of joint compound. Remove excess joint compound.
 2. Level 2: Provide for gypsum board substrates for FRP paneling and other panel application. Where Level 2 gypsum board finish is indicated or specified, apply embedding coat of joint compound for first coat and an additional coat of joint compound over all joints angles, fastener heads and accessories. Remove excess joint compound.
 3. Level 3: Not used.
 4. Level 4: Provide for gypsum board surfaces that will be exposed to view unless otherwise indicated. Where Level 4 gypsum board finish is indicated or specified, embed tape in finishing compound plus 2 separate coats applied over joints, inside angles, fastener heads, and accessories using ready-mixed, drying type, all-purpose taping compound. Feather out third coat approximately 6-inches from center of joint. After drying, sand or otherwise treat each coat and after last coat of the compound to provide a smooth even surface.
 5. Level 5: Provide for gypsum board surfaces indicated to receive non-textured finish and semi-gloss enamels. Where Level 5 gypsum board finish is indicated or

specified, embed tape in finishing compound plus 2 separate coats applied over joints, inside angles, fastener heads, and accessories using ready-mixed, drying type, all-purpose taping compound, plus a thin skim coat of joint compound over the entire gypsum board surface. After drying, lightly sand or otherwise treat the surface of the compound to provide a smooth even surface free of porosity or other surface variations.

- G. Treat external corners, edges, and ends with metal beads and edge trim. Finish with 3 coats of joint compound and feather out between 8-inches and 10-inches from the nose.
- H. The final application of compound and sanding shall leave all gypsum board surfaces uniformly smooth and in condition to receive specified finish.

3.7 REPAIR, CLEAN-UP AND PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- D. Repair fastener pops by driving a new fastener approximately 1-1/2 inches from the fastener pop and reset the popped fastener. When face paper is punctured, drive a new fastener approximately 1-1/2 inches from the defective fastener. Fill damaged surfaces with compound.
- E. Upon completion of the work, remove from adjacent surfaces, overspray, splatter and daubs of taping and finish compound and textured finishes. Remove tools, equipment, unused material and cuttings and leave the work in a clean orderly manner.

END OF SECTION

08/27/18

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain floor tile.
2. Porcelain glazed wall tile,
3. Marble thresholds.
4. Tile backing panels.
5. Waterproofing membrane.
6. Setting materials and grout materials.
7. Related accessories.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, indicating compliance with applicable standards.
 - 1. Mortar and grout manufacturer's technical data sheets indicating suitability for the installation specified and compliance with applicable standards.
 - 2. Sealant joint manufacturer's product and technical data.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples: Where colors and patterns are not specified, submit one set of samples of each type of tile specified showing the manufacturer's full range of standard colors and patterns for final selection. Where colors and patterns are specified, submit 2 samples of each color type and shape of tile and trim.
 - 1. Marble Thresholds in 6-inch lengths.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each type of tile issued by tile manufacturer and signed by the installer, only available after the material has shipped from the manufacturer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size installed.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Requirements for Physically Disabled: Provide ceramic tile flooring meeting the slip resistant requirements of 2016 California Building Code (CBC) Title 24 Part 2; and 2010 ADA Standards for Accessible Design.
- B. Floor tile shall have a coefficient of friction equal to, or greater than, 0.6 in accordance with ASTM C1028.
- C. Installer Qualifications: Employ a firm having a minimum of 5 years successful experience in the installation of ceramic tile and who has specialized in the installation of ceramic tile similar to that required for this Project.
 - 1. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.

- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical floor tile installation, minimum 50 square feet.
 - 2. Build mockup of typical wall tile installation, minimum 50 square feet.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- B. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during and after installation.
- C. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- D. Maintain minimum and maximum temperature limits as recommended by manufacturers.
- E. Protect adjacent surfaces during progress of the work in this section.
- F. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Acceptable manufacturers or equal:
 - Crossville Inc.; www.crossvilleinc.com
 - Dal-Tile International; www.daltile.com
 - Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Source Limitations for Tile: Obtain tile of each type from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with "Standard/First Grade" requirements per ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. Ceramic Tile: "Standard" grade units meeting the requirements of ANSI A137.1. Deliver tile in sealed cartons, identified with a Master Grade Certificate, on standard form of the Tile Council of North America, certifying grades, type and qualities of tile furnished.
- B. Floor Tile: Unglazed porcelain tile shall be standard/first grade quality as manufactured by Crossville Inc., Crossville, Tennessee, and shall conform to the requirements of ANSI A137.1 - 2012.
 - 1. Size: Porcelain and ceramic tile shall be manufactured to specific size after firing and shall be nominal 12" x 12". All measurements are in inches unless otherwise specified.
 - 2. Basis-of-Design Product: Porcelain tile shall be Cross-Colors® Solids Porcelain Stone®; and Cross-Colors® Mingles Porcelain Stone®.
 - 3. Thickness: Porcelain tile shall be manufactured to specific thickness after firing and shall be nominal 5/16".
 - 4. Colors: As selected by Architect.
 - 5. Surface Texture: Cross-Slate® (CS): The Cross-Slate finish combines the rustic and textured feel of slate with the through-body color and durability of Porcelain Stone®. Through-body color, unglazed structured surface, and a variety of sizes provide a strong commercial value where enhanced traction is needed for high traffic interior and exterior spaces. Cross-Slate is recommended for interior floors and walls as well as exterior walls and exterior walking surfaces in both residential and commercial environments.
 - 6. Product Test Data:
 - a. Water Absorption (ASTM C373): <0.10%.
 - b. Breaking Strength (ASTM C648): 350-420 lbs.
 - c. Bond Strength (ASTM C482): >200 psi.
 - d. DCOF Dynamic Coefficient of Friction (ANSI 137.1-2013): 0.50 - 0.60 wet.
 - 7. According to availability, provide matching trim shapes such as bullnose, corners, borders and cove base when specified.
 - 8. Environmental Properties: ANSI 138.1 Green Squared Certified.
 - 9. Trim Units: Provide all trim necessary to produce coved bases where shown, and rounded internal and external corners. Provide trim matching floor tile in color and texture.

- C. Wall Tile: Glazed porcelain tile shall be standard/first grade quality as manufactured by Crossville Inc., Crossville, Tennessee, and shall conform to the requirements of ANSI A137.1 - 2012.
1. Size: Porcelain and ceramic tile shall be manufactured to specific size after firing and shall be nominal 6" x 6". All measurements are in inches unless otherwise specified.
 2. Basis-of-Design Product: Porcelain tile shall be Cross-Colors® Solids Porcelain Stone®; and Cross-Colors® Mingles Porcelain Stone®.
 3. Thickness: Porcelain tile shall be manufactured to specific thickness after firing and shall be nominal 5/16".
 4. Colors: As selected by Architect.
 5. Surface Texture: Unpolished ® (UPS).
 6. Product Test Data:
 - a. Water Absorption (ASTM C373): <0.10%.
 - b. Breaking Strength (ASTM C648): 350-420 lbs.
 - c. Bond Strength (ASTM C482): >200 psi.
 - d. DCOF Dynamic Coefficient of Friction (ANSI 137.1-2013): 0.50 - 0.60 wet.
 7. According to availability, provide matching trim shapes such as bullnose, corners, borders and cove base when specified.
 8. Trim Units: Provide all trim necessary to produce bullnosed wainscot caps, and rounded internal and external corners. Provide trim matching wall tile in color and texture.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining. Beveled faces; profile as shown on drawings.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: Comply with ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints. Concrete glass fiber reinforced, 7/16-inch to 1/2-inch thick prefabricated panel, consisting of aggregate and portland cement reinforced with vinyl-coated woven glass-fiber mesh embedded in both surfaces. Acceptable products or equal:
- Custom Building Products; Wonderboard® Backerboard
Georgia-Pacific Gypsum LLC; DensShield® Tile Backer
Modulars, Inc.; Wonder-Board
USG Corporation; DUROCK Cement Board
1. Glass Fiber Tape: Coated glass fiber tape 2-inches wide as recommended by glass mesh mortar units.

2.6 WATERPROOFING MEMBRANE

- A. Waterproofing Membrane: Fluid-applied membrane, liquid-latex rubber or elastomeric polymer. Complying with ANSI A118.10: Where indicated on the Drawings, and elsewhere as required for waterproofing tile assembly as specified in ANSI A108.13.

Custom Building Products RedGuard® Waterproofing and Crack Prevention Membrane – Liquid Applied Membrane.

2.7 SETTING MATERIALS

- A. Installation Material Manufacturers:

1. Custom® Building Products; www.custombuildingproducts.com
2. MAPEI Corporation; www.mapei.com
3. Laticrete International; www.laticrete.com
4. Quikrete; www.quikrete.com

- B. Premixed Mortar Setting Bed: Where indicated on the Drawings, as required for mortar bed as the substrate for tile work; work to conform to ANSI A108.1.

1. Thick Bed Bedding Mortar, by Custom Building Products. Pre-blended underlayment specifically designed to float a mortar bed for ceramic tile. It is easy to mix and use, eliminating the need for site mixing of sand and cement. Thick Bed Bedding Mortar's 3:1 mix ratio provides a high-strength surface ideal for tiling commercial installations.
 - a. Complies with ANSI A108.1, ASTM C109, and ASTM C627.

- C. Latex Portland Cement Mortar (Thinset): ANSI A118.4 / A118.15. Provide acrylic type latex for exterior applications.

Custom Building Products
MAPEI, Keralastic System, consisting of Kerabond, dry-set mortar and keralastic latex admixture.

- D. Cementitious Tile Adhesives: ANSI A118.4 / A118.11: Polymer-Enhanced Mortars: Where indicated on the Drawings, and elsewhere as required for setting tile as specified by ANSI A108.5 or A108.12, Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar, over substrates prepared accordingly.

1. For use at Walls: Custom Building Products MegaLite® Crack Prevention Mortar or ProLite Fortified Mortar. With Shear Bond Strengths greater than 650 psi, per ANSI A118.4 and A118.15 Section 5.2.4. For wall assemblies where maximum strength is desired.
2. For use at Floors: For Crack Prevention due to Movement in Substrate: Custom Building Products MegaLite® Crack Prevention Mortar. With Shear Bond Strengths greater than 650 psi, per ANSI A118.4 and A118.15 Section 5.2.4. To minimize crack propagation from the substrate through the tile assembly, from cracks up to 1/8" wide.

- E. Water: Fresh, clean and potable, and free from such amounts of mineral and organic substances as would adversely affect the hardening of cement mortar.

- F. Reinforcing Wire Fabric: ASTM A185 or ASTM A497, 2 by 2 inch fabric, 16/16 wire, 3 by 3 inch fabric, 13/13 wire or 1.5 by 2 inch fabric, 16/13 wire.

2.8 GROUT MATERIALS

- A. Grout: Chemical Resistant, Acrylic and Silicone Resin Based, Single Component Grouting Material, Formulated for Stain Resistance, Meeting Performance Characteristics of ANSI A118.3 and A118.7, for grout joints from 1/16" inch to 1/2" inch in width:

Custom Building Products, FusionPro™ Single Component Grout, High Performance Grout. No mixing is required and is stain resistant. Available in 24 Colors.

- B. Elastomeric Joint Caulk: Provide where indicated on the Drawings, and elsewhere as required at joints between floors and walls and at joints between tile and dissimilar materials.

Custom Building Products Commercial 100% Silicone Caulk. Conforms to ASTM C 920 for movement joints in heavy traffic areas and ASTM C 794.

2.9 MISCELLANEOUS MATERIALS

- A. Tile and Grout Cleaner: Acceptable products, or equal:

Aqua Mix, Inc.; Heavy Duty Tile & Grout Cleaner
Custom Building Products; Concentrated Tile & Grout Cleaner

- B. Tile and Grout Sealer: Acceptable products, or equal:

Aqua Mix, Inc.; Sealers Choice Gold Penetrating Sealer
Custom Building Products; SurfaceGard Grout and Tile Sealer

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

- a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
- 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
- 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
 - 1. Remove protrusions, bumps and ridges by grinding or chipping.
 - 2. Repair, fill, and level cracks, holes, depressions and rough or chipped areas in substrate using patching material recommended by setting materials manufacturer.
 - 3. Slab to have light broom finish when tile is installed by thin-set method.
 - 4. Before tiling, verify that all surfaces to be tiled are structurally sound true to plane, and fall within maximum variations shown below: Ensure that the substrate is within the following tolerances:
 - a. Horizontal surfaces (floors): Maximum variation in substrate shall not exceed 1/4" in ten feet from required plane, depending on substrate.
 - b. Vertical surfaces (walls): Maximum variation in substrate shall not exceed 1/4" in ten feet from the required plane, depending on substrate.
 - c. Report all unacceptable surfaces to the Architect in writing, and do not tile such surfaces until they are leveled enough to meet above requirements.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE BACKING PANEL INSTALLATION

- A. General: Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install horizontally, with end joints over framing members. Secure to each framing member with screws spaced not more than 8-inches on center and not closer than 3/8-inch from the edge. Install screw heads flush with the surface of the board.
- C. Joint Treatment: Fill all horizontal and vertical joints and corners with dry-set portland cement, or latex-portland cement mortar. Apply glass fiber tape over joints and corners and embed with same mortar.

3.4 INSTALLATION OF WATERPROOF MEMBRANE

- A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproof membrane to cure and verify by testing that is watertight before installing tile or setting materials over it.

3.5 INSTALLATION OF CERAMIC TILE

- A. Manufacturers' Instructions: Perform work in compliance with standard accepted installation guidelines, Crossville Porcelain Stone/USA instructions and setting materials manufacturers' instructions.
- B. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - 2. For thin set adhesive mortar application use following technique:
 - a. With the flat side of trowel, key mortar into substrate.
 - b. Using the appropriate size trowel, comb mortar in one direction with notched side of the trowel.
 - c. Set tile with a sliding motion, perpendicular to the mortar ridges.
 - d. Obtain as near 100% coverage as possible of mortar to tile.
 - e. Mortar coverage shall be no less than 85% and shall be sufficiently distributed to give full support under all corners and edges of the tile.
 - f. Note: 95-100% coverage is mandatory for wet and exterior areas. Periodically, remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
- C. Apply setting material in accordance with manufacturer's directions and install tile before mortar has started initial cure. For thin set mortar application, use a notch trowel that will achieve the recommended coverage of mortar after tiles have been installed. Reference standard coverage information and follow manufacturer's recommendations for trowel size when using mortar.
- D. Do not spread more material than can be covered within 10 to 15 minutes. If "skinning" occurs, remove mortar and spread fresh material. Spread mortar with notches running in one direction that shall be perpendicular to the pressing, pushing and pulling of tile during placement.
- E. Place tile in fresh mortar, press, push and pull the tile slightly to achieve as near 100% coverage and contact of tile with setting material and substrate as possible. The coverage shall be no less than 85% and be sufficiently distributed to give full support of the tile. Make sure that all corners and edges are well supported with mortar. Leave no hollow corners or edges. NOTE: 95-100% coverage is mandatory for wet or exterior areas. A skim coat ("back-butter") of mortar can be placed onto the entire back of the tile using a trowel in order to assist in optimum adhesion and coverage of the mortar being used.
- F. Ensure there is a minimum 1/8" of mortar between tile and substrate after proper bedding. Installer must periodically remove sheets or individual tiles to assure proper bond coverage

consistent with industry specifications. If coverage is found to be insufficient, use a larger size notch trowel.

- G. Use a beating block and hammer or rubber mallet so that faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.
- H. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- I. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- J. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- K. Where accent tile differs in thickness from field tile, vary setting-bed thicknesses so that tiles are flush.
- L. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- M. Provide tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints smooth and even, without voids, cracks, or excess mortar or grout. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Porcelain Tile: 3/16 to 1/4 inch.
- N. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- O. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. Do not extend waterproofing membrane under thresholds set in dry-set portland cement or latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing membrane with elastomeric sealant.
- P. Cut and drill without marring the tile. Rub cuts smooth with a fine abrasive stone. Set no cut edge against fixtures, cabinets, or other tile without a joint at least 1/16-inch wide. Whenever possible, turn cut edges away from the adjoining wall. Fit tile around electric outlets, plumbing pipes, fixtures and fittings close enough to permit standard plates and collars to overlap the tile.
- Q. Keep tile dry while in packages. Take precautions to prevent staining of tiles before they are set. Do not install stained tile.
- R. Grouting:

1. Apply grout in accordance with ANSI A108.10, A108.6, A108.8, A108.9-2010 correlating to grout type chosen and manufacturer's recommendations.
2. Mix grout material in strict accordance with manufacturer's directions.
3. Force a maximum of grout into all joints. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps.
4. Grout joints full and integral with setting bed. Before grout sets, strike or tool the joints of cushion edge tile to depth of cushion, filling gaps; and with square-edged tile, fill joints flush with their surface.
5. Before grouting entire area do a test area to ensure there will be no permanent staining or discoloration of the tile and to verify that the grout is easily removed from the surface. If necessary, pre-coat exposed surfaces of tile with a grout release as recommended by the manufacturer, as this will facilitate removal of the grout.
6. Cure all setting and grouting materials in accordance with manufacturer's recommendations.

3.6 EXPANSION JOINTS

- A. Expansion and Control Joints: Provide expansion and control joints in tile work where indicated. Where joint locations are not indicated, provide joints spacing in accordance with TCNA Handbook Detail EJ171. Submit plan showing location of joints for approval. Construct joints in accordance with TCNA Handbook Detail EJ171 and as follows:
 1. Before grouting, keep joints open and clean by stuffing with paper or other material to prevent filling with dirt, grout, or mortar.
 2. After tile is grouted and completely dry, remove paper or other temporary filler material; brush joints clean and fill with back-up material, or bond breaker tape, and sealant as specified in Section 07 92 00.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. Tile and Grout Sealer: Apply sealer to grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer from tile faces by wiping with soft cloth.

3.8 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation at 1st Floor Restrooms: TCNA Method F112 and ANSI A108.1B; cement mortar bed (thickset) bonded to concrete.
 - a. Ceramic Tile Type: As specified in paragraph 2.3.B.
 - b. Mortar Bed: As specified in paragraph 2.7.B.
 - c. Bond Coat for Cured-Bed Method: Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar, as specified in paragraph 2.7.D.2
 - d. Grout: As specified in paragraph 2.8.A.
 - 2. Ceramic Tile Installation at 2nd Floor Restrooms: TCNA Method F115A; thinset mortar, epoxy grout.
 - a. Ceramic Tile Type: As specified in paragraph 2.3.B.
 - b. Thinset Mortar, as specified in paragraph 2.7.D.2.
 - c. Grout: As specified in paragraph 2.8.A.
- B. Interior Wall Installations, Metal Studs:
 - 1. Ceramic Tile Installation: TCNA Method W244C and ANSI A108.5; thinset mortar on cementitious backer units.
 - a. Ceramic Tile Type: As specified in paragraph 2.3.C.
 - b. Thinset Mortar: Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar as specified in paragraph 2.7.D.1.
 - c. Grout: As specified in paragraph 2.8.A.

END OF SECTION

08/27/18

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)
Acoustical Insulation Manufacturer's Association (AIMA)
Ceilings & Interior Systems Construction Association (CISCA)
DSA Interpretation of Regulations IR 25-2.13
General Services Administration Federal Specifications (Fed. Spec.)

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's catalog cuts, specifications, and other data for each component of the acoustical ceiling systems as necessary to demonstrate compliance with these specifications.
- B. Samples: Submit the following samples for review:
 - 1. 12-inch long samples of main tees, cross tees and perimeter molding.
 - 2. 6" by 6" samples of each type of acoustical units to be used in the work.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.5 CLOSOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size units equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed and concealed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical units, suspension-system components, and accessories to Project site in original, unopened packages bearing the manufacturer's name, brand designation, and label verifying compliance with these specifications. Store materials in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent continuously from 24 hours before installation until 24 hours after completion of work.

1.9 SCHEDULING

- A. Wet operations such as plastering, concrete and masonry work shall be completed and dry before installation of acoustical ceilings. Mechanical, electrical and other work above the ceiling line shall be completed and approved before start of acoustical ceiling installation.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace acoustical panel ceilings that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance Requirements: Furnish and install suspension systems in accordance with the suspension system manufacturer's current ICC Evaluation Services Report and 2016 California Building Code (CBC), Title 24 Part 2, Sec. 1607A.1; CBC Title 24 Part 2, Chapter 25 and Interpretation of Regulations IR 25-2.13 issued by the Division of the State Architect (DSA).
- B. Surface Burning Characteristics: Provide finish materials meeting requirements of Chapter 8 Section 803 of the 2016 CBC Title 24 Part 2 and that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal,

indicating the following fire performance characteristics tested in accordance with ASTM E84.

- a. Flame Spread Index: Not more than 25.
- b. Smoke Developed Index: Not more than 50.

2.2 ACOUSTICAL PANELS

A. General:

- 1. Low-Emitting Materials: Acoustical ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2. Acoustical Materials: ASTM E1264, with features as specified below. Furnish each type specified from one manufacturer, with the color and texture identical throughout.
 - a. Acoustical materials shall contain a minimum of 30 percent of recycled materials.

B. Basis-of-Design Product for **ACP-1**: Subject to compliance with requirements, provide stone wool panels, "Rockfon Artic®" by Rockfon®, or comparable product by one of the following:

Armstrong World Industries, Inc.
CertainTeed Corporation.
United States Gypsum Company.
Substitutions: Section 01 25 13 – Product Options and Substitutions.

- 1. Stone wool panels, "Rockfon Artic®" by Rockfon® with the following characteristics:
- 2. ASTM E1264 Classification: Type XX – Stone wool base with membrane-faced overlay, Pattern G.
- 3. Finish: Factory painted glass scrim surface.
- 4. Edges: Square.
- 5. Size: 24" x 24" and 24" x 48"
- 6. Thickness: 5/8".
- 7. NRC: 0.75.
- 8. CAC: 23.
- 9. AC: NA.
- 10. Fire Class: Class A.
- 11. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread Index: 0.
 - b. UL 723 (ASTM E84) Smoke Developed Index: 5.
- 12. Light Reflectance: 0.85.
- 13. Recycled Content: Up to 37%.
- 14. R Value (BTU Units): 2.2 to 2.6.

C. Basis-of-Design Product for **ACP-2**: Subject to compliance with requirements, provide stone wool panels, "Rockfon Tropic®" by Rockfon®, or comparable product by one of the following:

Armstrong World Industries, Inc.
CertainTeed Corporation.
United States Gypsum Company.
Substitutions: Section 01 25 13 – Product Options and Substitutions.

- 1. Stone wool panels, "Rockfon Tropic®" by Rockfon® with the following characteristics:
- 2. ASTM E1264 Classification: Type XX – Stone wool base with membrane-faced overlay, Pattern G.

3. Finish: Factory painted glass scrim surface.
4. Edges: Square.
5. Size: 24" x 24" and 24" x 48"
6. Thickness: 5/8".
7. NRC: 0.85.
8. CAC: 22.
9. AC: NA.
10. Fire Class: Class A.
11. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread Index: 0.
 - b. UL 723 (ASTM E84) Smoke Developed Index: 5.
12. Light Reflectance: 0.86.
13. Recycled Content: Up to 37%.
14. R Value (BTU Units): 2.2 to 2.6.

- D. Basis-of-Design Product for **ACP-3**: Subject to compliance with requirements, provide stone wool panels, "Rockfon Sonar®" by Rockfon®, or comparable product by one of the following:

Armstrong World Industries, Inc.
 CertainTeed Corporation.
 United States Gypsum Company.
 Substitutions: Section 01 25 13 – Product Options and Substitutions.

1. Stone wool panels, "Rockfon Sonar®" by Rockfon® with the following characteristics:
2. ASTM E1264 Classification: Type XX – Stone wool base with membrane-faced overlay, Pattern G.
3. Finish: Factory painted glass scrim surface.
4. Edges: Square.
5. Size: 24" x 24" and 24" x 48"
6. Thickness: 1".
7. NRC: 0.95.
8. CAC: 22.
9. AC: 190.
10. Fire Class: Class A.
11. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread Index: 0.
 - b. UL 723 (ASTM E84) Smoke Developed Index: 5.
12. Light Reflectance: 0.88.
13. Recycled Content: Up to 40%.
14. R Value (BTU Units): 2.6 to 3.5.

- E. Basis-of-Design Product for **ACP-4**: Subject to compliance with requirements, provide stone wool panels, "Rockfon Alaska®" by Rockfon®, or comparable product by one of the following:

Armstrong World Industries, Inc.
 CertainTeed Corporation.
 United States Gypsum Company.
 Substitutions: Section 01 25 13 – Product Options and Substitutions.

1. Stone wool panels, "Rockfon Alaska®" by Rockfon® with the following characteristics:
2. ASTM E1264 Classification: Type XX – Stone wool base with membrane-faced overlay, Pattern G.
3. Finish: Factory painted glass scrim surface.
4. Edges: Square.
5. Size: 24" x 24" and 24" x 48"
6. Thickness: 3/4".
7. NRC: 0.90.

8. CAC: 22.
 9. AC: 180.
 10. Fire Class: Class A.
 11. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread Index: 0.
 - b. UL 723 (ASTM E84) Smoke Developed Index: 5.
 12. Light Reflectance: 0.86.
 13. Recycled Content: Up to 39%.
 14. R Value (BTU Units): 2.6 to 3.1.
- F. Basis-of-Design Product for **ACP-5**: Subject to compliance with requirements, provide stone wool panels, "Rockfon Hygienic Plus™" by Rockfon®, or comparable product by one of the following:

Armstrong World Industries, Inc.
 CertainTeed Corporation.
 United States Gypsum Company.
 Substitutions: Section 01 25 13 – Product Options and Substitutions.

1. Stone wool panels, "Rockfon Hygienic Plus™" by Rockfon® with the following characteristics:
2. ASTM E1264 Classification: Type XX – Stone wool base with membrane-faced overlay, Pattern E.
3. Finish: Factory painted glass scrim surface.
4. Edges: Square.
5. Size: 24" x 24" and 24" x 48"
6. Thickness: 3/4".
7. NRC: 0.90.
8. CAC: 22.
9. AC: NA.
10. Fire Class: Class A.
11. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread Index: 0.
 - b. UL 723 (ASTM E84) Smoke Developed Index: 5.
12. Light Reflectance: 0.86.
13. Recycled Content: Up to 36%.
14. R Value (BTU Units): 2.6.

2.3 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
1. Chicago Metallic, Heavy Duty Non-Fire Rated Double Web Suspension System manufactured by Rockfon; 200 main runners; 1200 series cross runners.
 2. Armstrong; Prelude XL HD 7301 main runners and cross runners.
 3. USG Interiors, LLC; USG DONN® Brand DXW™ 1-1/2" Acoustical Suspension System.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and ASTM E580 Section 5.1, and designated by type, structural classification, and finish indicated.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted white.
6. Main Runners and Cross Tees: Double web type of cold rolled steel with protective coating and with painted steel caps. Width of exposed faces shall be 15/16-inch.
7. Intersections and Connections: Provide intersections and connections capable of withstanding a mean ultimate test load of not less than 180 pounds in compression and tension, per ASTM E580 Section 5.1.2.
8. Finish: Finish all exposed metal parts with a baked-on vinyl finish, matte white color.

2.4 ACCESSORIES

- A. Hanger Wires: Class 1 zinc coated (galvanized) carbon steel conforming to ASTM A641. Wire shall be #12 gage (0.106" diameter) with soft temper and minimum tensile strength = 70 ksi. The maximum allowable (ASD) tension load for wire meeting this specification is 350 pounds.
- B. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- C. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- D. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.
- E. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- F. Main Beam Splice Clip: Manufacturer's standard splice clip to reinforce main beam carrier where it is cut to make transition at top and bottom of sloped ceilings.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF CEILING SYSTEMS

- A. Comply with ASTM C636, Section 5.2 of ASTM E580, and manufacturer's written instructions.
- B. Place units as indicated on the drawings. Install with joints true and straight and junctures with ceilings, walls and openings neat and tight. Completed work shall present a smooth plane and level surface, free from unevenness, edge or corner offsets, cupping, scratches and other imperfections.
- C. Perform all cutting required for fixtures, pipes and other work passing through acoustical tile and panels. Neatly and tightly fit units to such work and adjoining work. Fit border units neatly and tightly against abutting surfaces. Replace loose and damaged tiles and panels when directed. Touch-up all damaged finishes. Leave all surfaces clean and free from marking and other disfigurement.
- D. #12 gage hanger wires may be used for up to and including a 4 foot by 4 foot grid spacing and shall be attached to main runners. Splices in hanger wires shall develop 50 percent of the wire allowable load.
- E. Hanger Wires: Space hanger wires as specified for each type of suspension system. Provide each hanger wire in one piece without splices.
 - 1. Anchor each wire to the structure above by one of the means detailed in CBC Sec. 25 and DSA IR 25-2.13. Bend hanger wires directly across the bulb of the main runner and tight against the connection device at supporting construction, then wrap the wire around itself in 3 tight wraps within 1-1/2 inches.
 - 2. Provide #12-gage hanger wires at the ends of all main and cross runners within 8 inches from the support or within 1/4 of the length of the end tee, whichever is least, for the perimeter of the ceiling area. Perimeter wires are not required when the length of the end tee is 8 inches or less.
 - 3. Provide trapeze or other supplementary support members at obstructions to maintain hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb shall have counter-sloping wires.
 - 4. Ceiling grid members shall be attached to 2 adjacent walls per ASTM E580, Section 5.2.3. Ceiling grid members shall be at least 3/4-inch clear of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free, with a minimum of 3/4-inch clear at wall.

5. The width of the perimeter supporting closure angle shall be not less than two inches. Use of perimeter angles with smaller widths in conjunction with proprietary perimeter clips may be acceptable in accordance with Section 5 of DSA IR 25-2.13.
 6. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral spreading. A metal strut or a #16-gage wire with a positive mechanical connection to the runner may be used and placed within 8 inches of the wall. Where the perpendicular distance from the wall to the first parallel runner is 8 inches or less, the stabilizer or #16 gage wire is not required.
- F. Install wall molding at the perimeter of the defined areas. Attach wall moldings to the wall at not more than 16-inches on center. On two adjacent walls attach each runner to the wall molding with a pop rivet. At opposite walls, provide metal struts or 16-gage wire with mechanical connection to the runner to prevent runners from spreading. Miter all corners of wall molding.
- G. Level the ceiling to within 1/8-inch in 10-feet in any direction.

3.4 LATERAL FORCE BRACING ASSEMBLY INSTALLATION

- A. Lateral force bracing assemblies consisting of a compression strut and four #12 gage splayed bracing wires oriented 90 degrees from each other are required for all ceiling areas.
1. Exception: Lateral force bracing may be omitted for suspended acoustical ceiling systems with a ceiling area not to exceed 144 square feet, for all values of SDS, when perimeter support is provided in accordance with Section 2.2 of IR 25-2.13 and perimeter walls are designed to carry the ceiling lateral forces.
- B. Lateral force bracing assemblies shall be spaced per Table 1 of IR 25-2.13 for all values of the component importance factor (I_p) of the ceiling.
- C. There shall be a brace assembly a distance of not more than one half of the above spacing from each surrounding wall, expansion joint and at the edges of any ceiling vertical offset. For example, where the brace spacing is 8' x 12', the edge distance shall be 4 feet in the direction of the 8 foot spacing and 6 feet in the direction of the 12 foot spacing.
- D. The slope of bracing wires shall not exceed 45 degrees from the horizontal plane and wires shall be taut. Splices in bracing wires shall develop the wire allowable load.
- E. Compression struts shall meet the following requirements:
1. The strut shall be sized to adequately resist the vertical component force induced by the ceiling bracing wires and have a maximum kl/r not to exceed 300. The struts listed in Appendix A meet this requirement for ceilings complying with the general requirements of IR 25-2.13.
 2. The strut shall not be more than one (horizontal) in six (vertical) out of plumb.

3.5 ATTACHMENT OF HANGER AND BRACING WIRES

- A. Fasten hanger wires with not less than 3 tight turns in 3 inches. Hanger wire loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops (see ASTM E580, Section 5.2.7.2).
- B. Fasten bracing wires with not less than 4 tight turns in 1-1/2 inches.

- C. Hanger and bracing wire anchorage to the structure shall be installed in such a manner that the direction of the anchorage aligns closely with the direction of the wire. (e.g. bracing wire ceiling clips must be bent as shown in the details and rotated as required to align closely with the direction of the wire, screw eyes in wood must be installed so they align closely with the direction of the wire, etc.).
- D. Separate all ceiling hanger and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc.
- E. Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to: piping, ductwork, conduit and equipment. Provide trapeze or other supplementary support members at obstructions to allow typical hanger spacing. Brace assemblies must be configured and/or located in order to avoid obstructions in addition to maintaining the required brace assembly spacing.
- F. Provide additional hangers, struts and brace assemblies as required at all ceiling breaks, soffits, or discontinuous areas.
- G. Hanger wires that are more than one (horizontal) in six (vertical) out of plumb shall have counter-sloping wires. Note: See ASTM C636, Figure 1, for counter-sloping methods.
- H. Attachment of the bracing wires to the structure above and to the main runners shall be adequate for the load imposed. The weight (W_p) shall be taken as not less than 4 psf for calculating seismic forces (F_p).
- I. Post-installed anchors (e.g. expansion anchors, screw anchors and power actuated fasteners) shall have a current Evaluation Report acceptable to DSA in accordance with IR A-5.
- J. Power-actuated fasteners in concrete are not permitted for bracing wires.

3.6 EXPANSION JOINTS, SEISMIC SEPARATION JOINTS

- A. Expansion joints shall be provided in the ceiling at intersections of corridors and at junctions of corridors and lobbies or other similar areas.
- B. For ceiling areas exceeding 2,500 square feet, a seismic separation joint shall be provided to divide the ceiling into areas not exceeding 2,500 square feet in accordance with ASTM E580, Section 5.2.9.

3.7 CEILING FIXTURES, TERMINALS, AND DEVICES

- A. All fixtures, terminals, and other devices shall be mounted in a manner that will not compromise ceiling performance in accordance with Section 13.5.6.2.2 Item 5 of ASCE 7 as amended by CBC Section 1616A.1.20 (1616.10.16*) and ASTM E580 Sections 5.3 and 5.4.
- B. Ceiling panels shall not support any light fixtures, air terminals or devices.
- C. Penetrations through the ceiling for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a 2-inch oversized ring, sleeve or adapter through the ceiling tile to allow free movement of 1-inch in all horizontal directions. Alternatively, per ASTM E580, Section 5.2.8.5, a flexible sprinkler hose fitting that can accommodate 1-inch of ceiling movement shall be permitted to be used in lieu of the oversized ring, sleeve, or adapter.

- D. Slack safety wires shall be considered hanger wires for installation and testing requirements.

3.8 LIGHT FIXTURES

- A. All light fixtures shall be positively attached to the ceiling suspension systems by mechanical means per CEC Article 410.36 to resist a horizontal force equal to the weight of the fixture. A minimum of two screws or approved fasteners are required at each light fixture, per ASTM E580, Section 5.3.1.
- B. Surface-mounted light fixtures shall be attached to the main runner with at least two positive clamping devices on each fixture. The clamping device shall completely surround the supporting ceiling runner and be made of steel with a minimum thickness of #14 gage. Rotational spring catches do not comply. A #12 gage slack safety wire shall be connected from each clamping device to the structure above. Provide additional supports when light fixtures are 8 feet or longer or exceed 56 lb. Maximum spacing between supports shall not exceed 8 feet.
- C. Light fixtures weighing less than or equal to 10 lb. shall have a minimum of one #12 gage slack safety wire connected from the fixture housing to the structure above.
- D. Light fixtures weighing greater than 10 lb. but less than or equal to 56 lbs. may be supported directly on the ceiling runners, but they shall have a minimum of two #12 gage slack safety wires connected from the fixture housing at diagonal corners to the structure above.
 - 1. Exception: All light fixtures greater than two by four feet weighing less than 56 lbs. shall have a #12 gage slack safety wire at each corner.
- E. All Light fixtures weighing greater than 56 lb. shall be independently supported by not less than four taut #12 gage hanger wires (one at each corner) attached from the fixture housing to the structure above or other approved hangers. The four taut #12 gage wires or other approved hangers, including their attachment to the structure above, shall be capable of supporting 4 times the weight of the fixture.

3.9 SERVICES WITHIN THE CEILING

- A. All flexible sprinkler hose fitting mounting brackets, ceiling-mounted air terminals or other services shall be positively attached to the ceiling suspension systems by mechanical means to resist a horizontal force equal to the weight of the component. Screws or approved fasteners are required. A minimum of two attachments are required at each component.
- B. Ceiling-mounted air terminals or other services weighing less than or equal to 20 lb. shall have one #12 gage slack safety wire attached from the terminal or service to the structure above.
- C. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 20 lb. but less than or equal to 56 lb. shall have two #12 gage slack safety wires (at diagonal corners) connected from the terminal or service to the structure above.
- D. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 56 lb. shall be supported directly from the structure above by not less than four taut #12 gage hanger wires attached from the terminal or service to the structure above or other approved hangers. The four taut #12 gage wires or other approved hangers, including their attachment to the structure above, must be capable of supporting four times the weight of the unit.

3.10 OTHER DEVICES WITHIN THE CEILING

- A. All lightweight miscellaneous devices, such as strobe lights, occupancy sensors, speakers, exit signs, etc., shall be attached to the ceiling grid per Section 2.6.2 a) of IR 25-2.13. In addition, devices weighing more than 10 lbs. shall have a #12 gage slack safety wire anchored to the structure above per Section 2.6.1 b) of IR 25-2.13. Devices weighing more than 20 lbs. shall be supported from the structure above using details provided by the registered design professional (RDP).

3.11 PENDANT MOUNTED LIGHT FIXTURES

- A. Where pendant mounted light fixtures are to be installed in areas with a suspended ceiling, the construction documents shall include complete support details complying with IR 25-2.13 and DSA IR 16-9.
- B. Support pendant-mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting 2 times the weight of the fixture.
- C. If a pendant mounted light fixture is directly and independently braced below the ceiling (i.e., aircraft cables to walls), then a brace assembly is not required above the ceiling.
- D. If a pendant mounted light fixture is free to swing 45 degrees from vertical in all directions, and is not directly and independently braced below the ceiling, then a bracing assembly is only required where the pendant hanger penetrates the ceiling. Special details are required to attach the pendant hanger to the bracing assembly to transmit the horizontal and vertical forces. Exception: Where the weight of the fixture is less than 20 pounds, the vertical component of the brace force need not be considered so no compression strut/post is required.
- E. Rigid conduit shall not be used for attachment of the fixtures.

3.12 INSTALLATION OF ACOUSTICAL UNITS

- A. Install acoustical units with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 - 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 3. Install hold-down clips and seismic clips in areas indicated, in areas required by authorities having jurisdiction; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
 - 4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.13 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- C. Remove all debris resulting from the work of this section.

END OF SECTION

03/14/19

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 09 68 13 – Tile Carpeting.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Roppe Corporation, USA; Pinnacle Rubber Base.
 2. Armstrong World Industries.
 3. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 4. Flexco.
 5. Johnsonite; A Tarkett Company.
- B. Product Standard: ASTM F 1861, Type TS (Thermoset Vulcanized Rubber), Group I (solid, homogeneous).
 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Standard Toe (Cove base): Provide in areas with polished concrete flooring and sealed concrete flooring.

- C. Thickness: 0.125 inch.
- D. Height: 4 inches unless otherwise noted.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As selected by Architect from full range of industry colors.

2.3 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; A Tarkett Company.
 - 5. Roppe Corporation, USA.
- B. Description: Carpet edge for glue-down applications, and transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors: As selected by Architect from full range of industry colors..

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges,

depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

08/27/18

SECTION 09 65 43

LINOLEUM FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes linoleum sheet flooring.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Work:
 - 1. Section 03 35 07 "Concrete Vapor Control Treatment."
 - 2. Section 09 65 13 "Resilient Base and Accessories."

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. ASTM International:
 - 1. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction.
 - 2. ASTM F 2034 - Standard Specification for Linoleum Sheet Floor Covering.
 - 3. ASTM F 1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - 4. ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
 - 5. ASTM F 1861 - Standard Specification for Resilient Wall Base.
 - 6. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 7. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 8. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 253 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 2. NFPA 258 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- D. International Standards and Training Alliance (INSTALL):
 - 1. INSTALL Resilient Certification.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.
 - 1. Show details of special patterns.
- C. Samples for Initial Selection: For each type of linoleum flooring indicated.
- D. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of linoleum flooring required.
 - 1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- E. Heat-Welded Seam Samples: For each linoleum flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.
- F. Product Schedule: For linoleum flooring. Use same designations indicated on Drawings.
- G. Manufacturer's Installation Procedures: Submit a current copy of the flooring manufacturer's recommended standard installation procedure for each type of flooring material.
- H. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Manufacturer's Maintenance Instructions: Submit to the Owner, a current copy of the flooring manufacturer's printed recommendations for maintenance methods and products for each type of flooring material. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sheet Flooring: Furnish not less than 5 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each type, color, and pattern of sheet flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 1. Engage installer certified as a Forbo "Associate Mechanic" or INSTALL certified Resilient Installer (standard installations).
 - 2. Certificate: Submit certificate indicating installer qualification.

- B. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used for flooring installation shall not exceed the limits permitted under the current regulations of the Bay Area Air Quality Management District.
- C. Requirements for Physically Disabled: Provide resilient flooring meeting the slip resistant requirements of 0.6 minimum in accordance with ASTM D2047, the 2016 California Building Code (CBC) Title 24 Part 2; and 2010 ADA Standards for Accessible Design.
- D. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements. Comply with Division 1 Project Meetings Section.
- E. Pre-Installation Testing: Not required. Confirm that concrete vapor control treatment has been successfully applied to concrete slab substrates.
- F. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for flooring including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to the site in the manufacturer's original unopened containers clearly labeled with manufacturer's name, brand designation and production run number.
- B. Storage and Handling: Store flooring and installation materials in dry spaces protected from the weather with ambient temperatures maintained between 50 degrees F and 90 degrees F. Store on flat surfaces. Move flooring and installation accessories into spaces where they will be installed at least 48 hours before installation at a minimum temperature of 70 degrees F.

1.9 FIELD CONDITIONS

- A. Maintain spaces in which flooring is to be installed between 70 degrees F and 90 degrees F for at least 7 days prior to, during, and 7 days after installation. After this period, maintain a temperature of not less than 55 degrees F. Areas to receive flooring shall be adequately lighted to allow for proper inspection of the substrate, installation and seaming of the flooring, and for final inspection.
- B. Close spaces to traffic while installing floor covering.
- C. Close spaces to traffic for 72 hours after flooring installation.
- D. Install flooring after other finishing operations, including painting, have been completed.
- E. Provide adequate ventilation to remove moisture and fumes from the area.

1.10 WARRANTY

- A. Project Warranty: Refer to Section 01 78 36 "Warranties" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - 1. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For linoleum flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 Watts/sq.cm.
 - 2. Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).
- B. Flooring shall have a coefficient of friction equal to, or greater than, 0.5 in accordance with ASTM D2047.

2.2 LINOLEUM SHEET FLOORING

- A. Manufacturer:
 - 1. Forbo Flooring Systems; www.forboflooringna.com.
 - 2. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: Marmoleum® Decibel Linoleum Sheet and Linoleum Adhesive.
 - 1. Description: Homogeneous sheet linoleum of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto natural jute backing with an applied polyolefin comfort layer. Pattern and color shall extend throughout total thickness of material.
 - 2. Width: 2 Meters (79").
 - 3. Length: 27 Meters (89 Linear Feet).
 - 4. Gauge: 3.5mm (0.137").
 - 5. Backing: Jute/Polyolefin Foam.
 - 6. Pattern and Color(s): As selected by Architect from manufacturer's standard patterns and colors.
 - 7. Adhesive: Forbo Flooring, Inc., L 885 Adhesive.
 - 8. Heat Welding Rod: Forbo Flooring, Inc., Marmoweld® color-matched solid color welding rod.
 - 9. Topshield2™ High Performance Finish: Double UV cured double layer technology delivers extraordinary performance and clear and vibrant colors that remain over time. Topshield2™ creates a 'ready to use' Marmoleum that requires no initial maintenance or polymer application. The surface can be repaired or refreshed in cases of accidents or after years of intensive use.
 - 10. Meets or exceeds all technical requirements as set forth in ASTM F 2034 - Standard Specification for Linoleum Sheet Floor Covering, Type III.
- C. Seaming Method: Heat welded seams.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by linoleum flooring manufacturer for applications indicated.
 - 1. Where floors require extensive leveling or repair necessitating several thicknesses of leveling compound, use one of the following products or equal:

Industrial Products, Inc.; Vi-Tex Leveling Compound
Armstrong Floor Div.; Underlayment S-180
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before installing resilient flooring, wall base, or other accessories, examine substrates to ensure that they are dry, clean of paint spots, oil, grease, wax, bond-breaking or curing compounds, and other materials whose presence would interfere with bonding of adhesive.
- B. Subsurface shall also be free from trowel marks, pits, dents, or other unusual roughness and sharp edges that would cause protrusions and bulges after resilient material is laid.
- C. Examination shall include bond testing of concrete subfloors.
- D. Correct defective surfaces or conditions preventing proper execution of the work. Starting of work without such correction will be considered acceptance by the Contractor of the surface involved.

3.2 SURFACE PREPARATION

- A. Concrete vapor control treatment is specified in Section 03 35 07. All concrete slab surfaces scheduled to receive resilient flooring shall receive concrete vapor control treatment.
- B. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- C. Surface Preparation:
 - 1. General: Prepare floor substrate in accordance with manufacturer's instructions.
 - 2. Floor Substrate: Floors shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.
 - 3. Concrete Floor Substrate:
 - a. Reference Standard: Comply with ASTM F 710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- D. Concrete Moisture Testing: Not required. Confirm that concrete vapor control treatment as specified in Section 03 35 07 has been successfully applied to concrete slab substrates.

- E. Concrete pH Testing: Not required. Confirm that concrete vapor control treatment as specified in Section 03 35 07 has been successfully applied to concrete slab substrates.
- F. Conduct an adhesive bond test before starting the installation. Bond testing will assist in identifying both the working characteristics of the adhesive (Waiting and working time) for the site conditions, and also any potential bonding problems.
- G. Fill minor joints, cracks, or depressions in concrete slabs and subfloors with floor patch. Where floors require extensive leveling or repair necessitating several thicknesses, use leveling compound. Allow 24 hours drying time for leveling compound before applying resilient flooring.
- H. Do not begin installation until work of other trades in the area, including painting, has been completed.
- I. Apply concrete slab primer, if recommended by flooring manufacturer, before applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing flooring.
- B. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- E. Install flooring on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- F. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- G. Heat-Welded Seams: For seamless installation, comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

- A. Unroll linoleum sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out linoleum sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.

5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

3.5 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
 1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.
 2. Sweep and vacuum floor after installation.
 3. Do not wash floor until after time period recommended by flooring manufacturer.
 4. Damp mop flooring to remove black marks and soil.

3.6 PROTECTION

- A. Until floors are well seated, at least 72 hours, at a maintained temperature of not less than 70 degrees F, keep traffic to an absolute minimum, and under no conditions allow fixtures, equipment, trucks, or similar heavy traffic.
- B. For the entire period between installation of resilient flooring and acceptance of the Work by the Owner, protect floors from damage using methods recommended by the flooring manufacturer. Remove and legally dispose of protective covering at time of Substantial Completion.

3.7 INITIAL MAINTENANCE PROCEDURES

- A. General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.
- B. Initial maintenance "Starter Kit" supplied by manufacturer. Initial maintenance to be conducted by flooring contractor.
- C. Drying Room Yellowing: Expose installed linoleum to either natural or artificial light to allow "drying room yellowing" (the film is a natural occurrence of the oxidation of the linseed oil in linoleum products) on installed linoleum flooring to disappear prior to initiating temporary protection procedures.

END OF SECTION

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SECTION 09 67 23

URETHANE CEMENT COMPOSITION FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the 1/4" urethane cement composition flooring and integral base with antimicrobial/antibacterial, chemical resistant Novolac (or equal) epoxy topcoat as scheduled on the drawings and/or specified herein.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 03 30 00 "Cast-in-Place Concrete". Concrete should be either water cured or cured using sodium silicate curing compounds only. Concrete should be cured for a minimum of 28 days.
 - 2. Slab shall be depressed per Section 03 30 00 at areas to receive Urethane Cement flooring.
 - 3. Section 22 00 00 "Plumbing": Floor Sinks, floor drains, clean-outs, etc. should be of the "floor-flange" type as manufactured for use with Urethane Cement flooring.

1.2 ACTION SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical data, installation/application instructions and general recommendations for the urethane cement composition flooring specified herein. Include data on smoke and flame spread ratings.
 - 1. Submit manufacturer's installation instructions.
 - 2. Submit manufacturer's standard details for transitions, coved base, thresholds, floor drains and other similar conditions within the project.
- C. Samples for initial selection:
 - 1. Submit 2-1/2" x 4" samples from manufacturer's standard color palette as designated by the Architect.
 - 2. Submit nonslip texture samples of topcoat only for Architect's approval, texture shall be "medium" finish.
- D. Samples for Verification: For each resinous flooring system or color specified, provide two each, 6" by 6" samples in the selected color and texture, applied to a rigid backing by the installing contractor for this project.

1.3 INFORMATIONAL SUBMITTALS

- A. Contractor Certification: Submit a letter from the primary materials manufacturer certifying that the installing contractor has been properly trained in the application of the materials

being installed, is acceptable to the materials manufacturer, with a record of successful in-service performance.

1. Engage an installer who employs only persons trained and approved by the resinous flooring manufacturer for applying resinous flooring systems specified.
 2. Engage an installer who is certified in writing by the resinous flooring manufacturer as a factory trained applicator qualified to apply the specified resinous flooring system.
- B. Reference jobs: Provide names and contact information for at least 3 projects similar to this project and using the specified system or the proposed equivalent system that are at least 5 years old and were installed by this Installing Contracting Company with the crew who will install this project. Reference installations must be within 100 miles of this project.
- C. Material certificates signed by manufacturer certifying that the urethane cement composition flooring with Novolac topcoat complies with requirements specified herein.
- D. Material Test Reports: Submit Base Manufacturer's EPA licensing documentation and permitting for Antimicrobial/Antibacterial System as well as base manufacturer's documentation showing the Antimicrobial/Antibacterial has long-term service life in the cured epoxy is not simply an "in-can preservative" and is effective against bacteria, microbes, fungi and mildew.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Submit manufacturer's written instructions for recommended maintenance practices.
- B. Joint Warranty: Submit written letter from manufacturer and Contractor offering one year joint applicator/manufacturer labor and material warranty on this specific project. Contact Richard V. Swan & Associates for Dex-O-Tex Applicators and other information: (650) 992-7100.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator who has specialized in installing resinous flooring types similar to that required for this Project and who offers a joint applicator/manufacturer labor and material warranty with the producer of primary materials.
- B. Single Source Responsibility: Obtain urethane cement composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer. Provide secondary materials, including patching and fill materials, joint sealant, accessory items, and repair materials of a type and from a source recommended by the manufacturer of the primary materials.
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set the standard of quality for materials and installation.
1. Apply all components of the specified resinous flooring system at the specified thickness and finished in the texture and color as selected. Apply a minimum 100 square feet area to simulate the actual installation characteristics. Include areas that demonstrate the finished cove base, joint detailing, terminations or any other special conditions.
 2. Simulate finished lighting conditions for Architects review of mockups.
 3. Approved mockups may become part of the completed work if undisturbed at the time of substantial completion.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with urethane cement composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.
- B. Lighting: Permanent or adequate temporary lighting shall be in place and working before installing resinous flooring.
- C. Moisture Vapor Transmission: Perform Calcium Chloride test in conformance to ASTM F1869 or In Situ relative humidity test conforming to ASTM F2170 to determine moisture vapor emission levels prior to application of any component of the flooring system. Do not install flooring over substrate with MVT emission levels in excess of 14 lbs. per 24 hour period over a 1000 square foot area or with a relative humidity in excess of 88%. Notify the Architect immediately if MVT or rh levels exceed these levels.
- D. HVAC and ventilation: HVAC shall be operational during installation of the flooring system. Provide any additional ventilation and provisions for isolation of fumes, odors or vapors as required by the Owner and the Project. Provide temporary electric heating and ventilation if permanent HVAC system is not operating when flooring is installed. No fossil fuel heating permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Troweled 1/4" urethane cement composition flooring: Dex-O-Tex Tek-Crete SL as manufactured by Crossfield Products Corp.; Rancho Dominguez, California; or equal.
- B. Trowel applied polyacrylate resin composition underlayment: Dex-O-Tex A-81 as manufactured by Crossfield Products Corp., Rancho Dominguez, California; or equal.
- C. Novolac Epoxy Topcoat: Dex-O-Tex Posi-Tred CR with color as selected by the Architect from manufacturer's standard color palette as manufactured by Crossfield Products Corp.; Rancho Dominguez, California; or equal.
- D. Non-slip aggregate: Dex-O-Tex Synthetic Aggregate as manufactured by Crossfield Products Corp.; Rancho Dominguez, California; or equal.
- E. EPA-Licensed Antimicrobial/Antibacterial System: Dex-O-Tex Dexcide Antimicrobial System, or equal. Add to Posi-Tred CR Epoxy Topcoat.

2.2 PROPERTIES

- A. Color(s): To be selected by Architect from manufacturer's standard colors. Color(s) to be non-UV reactive.
- B. Drawing Designation: UCF-1. Refer to A-601 Interior Finish Schedule for additional description and location information.
- C. Physical Properties: Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

URETHANE MORTAR

Compressive Strength (ASTM C579):	8,100 psi.
Density (ASTM C905):	130 lbs/ft ³
Water Absorption (MIL PRF-3134):	0.64%
Surface Hardness (ASTM D2240):	85- 90 Durometer "D"
Abrasion Resistance (ASTM D1044):	0.0 gr.
Adhesion (ASTM D4541):	>400 psi (100% failure in concrete)
Flammability-Critical Radiant Flux (ASTM E648):	Greater than 1.07 watts/cm ²
Resistance to Fungal Growth (ASTM G21):	Passes Rating 1

NOVOLAC TOPCOAT:

Chemical Resistance:	(Total Immersion – 7 days)
ASTM D-1308	No Effect
Citric Acid (70%)	No Effect
Hydrochloric Acid (46%)	No Effect
Sulfuric Acid (96%)	No Effect
Sodium Hydroxide (50%)	No Effect
Lactic Acid	No Effect
Methyl Ethyl Ketone	No Effect
Hydraulic Fluid	No Effect
Butyl Acetate	No Effect
Resistance to Immersion:	
MIL-D-23003A Para. 4.6.11	No softening, loss of
SAE 10 Oil	adhesion or other
Detergent Solution	form of deterioration
Fire Resistance:	Flame Spread Index - 0
ASTM E-162	Smoke Deposited - 2mg

A81 - POLYACRYLATE CEMENT UNDERLAYMENT:

Compressive Strength ASTM C109	4140 psi
Tensile Strength ASTM C307	800 psi
Flexural Strength ASTM C580	1,200 psi
Weight	130 pounds/ft ³
Hardness ASTM D2240, Shore D	70-75
Adhesion ASTM D4541	>400 psi (100% failure in concrete)
Indention MIL-D-3134, Para 4.7.4.2.1	2.26%
(Steadily Applied Load, 2,000 lbs. On 1" steel ram imposed for 30 min.)	
Water Absorption MIL-D-3134	3.14%
Flammability	Non-combustible
Impact Resistance (Gardner Impact Tester):	No chipping, cracking, or delamination more than 0.014".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions where the urethane cement composition flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.
- B. Moisture Test: Perform moisture tests in conformance with ASTM F 1869 and ASTM F 2170.
- C. Permanent and/or temporary lighting and HVAC are to be installed and operating at the time of installation of the flooring system.
- D. Provide dust and odor control and ventilate area where flooring is being installed.
- E. Restrict traffic from area where flooring is being installed or is curing.

3.2 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.
- B. Concrete Surfaces: Shot-blast or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.
- C. Provide Dex-O-Tex VaporControl Primer 100 concrete primer at very porous substrate surfaces or at substrate surfaces that exceed the manufacturer's maximum vapor emission levels.
- D. Materials: Mix resin hardener and aggregate as required, and prepare materials according to flooring system manufacturer's instructions.

3.3 APPLICATION

- A. General: Apply each component of urethane cement composition flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
- B. Install underlayment to create slope for drainage. Urethane Cement Floor System Contractor shall provide slope in the floor system for drainage at floor drains, floor sinks and troughs. Provide underlayment as required to eliminate all "birdbaths" at flooring. Cut and grind substrate as necessary.
- C. Body Coat: Over prepared surface, Screed mortar mix at nominal 3/16"- 1/4" thickness as specified. Allow material to flow out and begin to settle. Back roll with a spike roller or looped roller as appropriate to distribute material; hand-trowel to a smooth even finish.

- C. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 6 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, troweling, and sanding, of cove base.
- D. Antimicrobial/Antibacterial Novolac Epoxy Topcoat: Apply 2 coats of novolac epoxy topcoat incorporating nonslip aggregate, (color as selected by Architect) and antimicrobial/antibacterial additive throughout all Kitchen and Serving floor areas.
- E. Transitions: At all door thresholds and transitions to other flooring materials, grind the substrate to accommodate the thickness of the Tek-Crete flooring and terminate in a 1/4" wide by 1/2" deep sawcut as necessary to meet adjacent elevations. Tek-Crete may be thinned to 1/8" thickness at transitions.
- F. Provide integral radius cove base transitions at walls and curbs throughout Kitchen and Serving area flooring.
- G. Top of Base: Install a continuous SST "Z" flashing, embedded in a continuous bead of high quality polyurethane sealant Sikaflex-1A One Part Polyurethane, Elastomeric Sealant, Alum Grey color along the top of the coved base to substrate.

3.4 CURING, PROTECTION AND CLEANING

- A. Cure urethane cement composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.
- B. Protect floor from spills and washing for a minimum of 4 days after installation is complete.

END OF SECTION

08/27/18

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular carpet tile.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 03 35 07 "Concrete Vapor Control Treatment."
2. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Association of Textile Chemists and Colorists (AATCC)
ASTM International (ASTM)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

- C. Samples: For each of the following products and for each color and texture required. Label each sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet: Submit minimum 24 by 24 inch samples of each type of carpet showing full range of color, texture, and pattern variations expected. Prepare samples from same materials to be used for the project.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Submittal procedures and quantities are specified in Section 01300.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 square yards.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. The quantity of volatile organic compounds (VOC) used in leveling and patching compounds and adhesives shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District and South Coast Air Quality Management District.
 - 2. Floor Finish Materials: Meet the requirements of 2016 CBC Title 24 Part 2 Chapter 8 - Interior Finishes, Section 804.
- B. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association.

- C. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups at locations and in sizes directed by the Architect.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.

1.9 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Warranty Performance Requirements:
 - 1. Warranty shall be for Lifetime on all items except as specified herein.
 - 2. Lifetime warranty shall cover face components and backing components.
 - 3. Warranty shall be non-prorated.
 - 4. Carpet manufacturer shall warrant both product and adhesive systems.
 - 5. Provide manufacturer's lifetime warranties as follows:
 - a. Wear.
 - b. Static.
 - c. Edge ravel.
 - d. Zippering.
 - e. Dimensional stability.
 - f. Impervious to liquids.
- C. Supplemental Fiber Warranty Items:
 - 1. Colorfastness to light.
 - 2. 10 year stain warranty.
 - 3. 10 year colorfastness to atmospheric contaminants.

PART 2 - -PRODUCTS

2.1 CARPET TILE

- A. General: Carpet shall contain a minimum of 10 percent of recycled materials.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Interface Corp.
 - 2. Lees Commercial Carpet.
 - 3. Mohawk Group (The); Mohawk Carpet, LLC.
 - 4. Shaw Contract Group; a Berkshire Hathaway company.
 - 5. Tandus-Centiva.
- C. Basis-of-Design Product:

The Mohawk Group, www.themohawkgroup.com; One First Tile

2.2 MODULAR CARPET TILE CONSTRUCTION

- A. Modular backing composite shall be constructed in the following manner:
 - 1. Backing Material/Composition:
 - a. Primary: Reinforced synthetic, non woven.
 - b. Bonding Agent: Premium vinyl composite polymer.
 - c. Secondary: Fiberglass reinforced vinyl composite polymer.
 - d. Total Backing Weight: Minimum of 110 ounces per square yard.
- B. Carpet Type: Carpet shall meet the following minimum requirements:

1. Style Name:	One First Tile
2. Style Number:	MT086
3. Color:	As selected by Architect
4. Tufted Pile Weight:	24.0 oz. per sq. yd.
5. Product Type:	Tile
6. Construction:	Tufted
7. Minimum Sq. Yd.:	No Minimum
8. Surface Texture:	Textured Patterned Loop
9. Gauge:	1/12
10. Density:	6,546
11. Weight Density:	157,104
12. Stitches Per Inch:	9.0
13. Finished Pile Thickness:	0.132"
14. Dye Method:	Solution Dyed
15. Backing Material:	EcoFlex ICT
16. Fiber Type:	Colorstrand® SD Nylon
17. Pattern Repeat:	Not Applicable
18. Size:	24" x 24"
19. Installation Method:	MultiDirectional, Monolithic, QuarterTurn
20. Soil Release Technology:	Sentry Soil Protection
21. GSA Stain Release Rating:	Pass
22. Foot Traffic Recommendation TARR:	Severe
23. Sustainability:	

- C. Sustainable Design Requirements:

- | | | |
|----|--------------------------------|------------------------------|
| 1. | IAQ Green Label Plus: | CRI Green Label Plus GLP1098 |
| 2. | Pre-Consumer Recycled Content: | 48% |
| 3. | NSF 140: | EcoFlex ICT - NSF 140 Gold |
| 4. | Declare Label: | Declared |

D. Antimicrobial Treatment: Manufacturer's standard material.

E. Performance Characteristics: As follows:

1. Electrostatic Propensity: Less than 3.5 kV according to AATCC-134.
2. Flammability: ASTM E 648 Class 1 (Glue Down).
3. Smoke Density: ASTM E 662 Less than 450.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.
- E. Concrete vapor control treatment is specified in Section 03 35 07. All concrete slab surfaces scheduled to receive carpet tile flooring shall receive concrete vapor control treatment.
- F. Do not install carpet over concrete with excessive moisture or dust producing surface that is not adequately sealed.

3.3 INSTALLATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Mill-applied, peel-and-stick adhesive.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer and as shown on reviewed shop drawings.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.

2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

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SECTION 09 77 23

FABRIC COVERED TACK PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fabric covered tack paneling.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 09 29 00 - Gypsum Board: Wall Substrates.
 - 2. Section 26 51 00 - Lighting: Permanent during installation.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturers' product data for each type of panel core material and fabric backed vinyl covering specified.
 - 1. Include technical information, installation instructions, and maintenance instructions.
 - 2. Include data on physical characteristics, durability, fade resistance and flame resistance characteristics.
- B. Shop Drawings: Submit shop drawings showing panel dimensions, details, locations, trim, anchoring and all other pertinent information.
- C. Samples: Submit samples for verification: 8-inch square units displaying the substrate material and fabric backed vinyl coating and demonstrating quality, weight, color range and pattern variation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Submit certificates signed by manufacturers of core material and wall coverings certifying that materials furnished comply with specified requirements.
 - 1. Include certified test reports evidencing compliance with requirements for fire performance characteristics and physical properties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Submit manufacturer's written instructions for recommended maintenance of vinyl covered tackboard panel specified. Include acceptable methods and materials recommended to maintain products in anticipated areas of use.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Replacement Materials: Furnish not less than 3 percent of the total installed, or minimum 4 of each type, color, and pattern of vinyl covered tackboard panel installed for maintenance purposes. Furnish replacement materials from same production run as installed materials. Protect material with clearly marked packaging indicating product identification and project location.

1.7 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide facing materials that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal, indicating the following fire performance characteristics tested in accordance with ASTM E84.
 - 1. Flame Spread: Not more than 25.
 - 2. Smoke Developed: Not more than 50.
- B. Physical Properties for Vinyl Wallcoverings: Adhesion of vinyl film, minimum 3-pounds per square inch when tested in accordance with ASTM D751.
- C. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in adhesives, substrate fillers, primer/sealers, surface cleaners, shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.8 QUALIFICATIONS

- A. Manufacturer: Provide each type of vinyl covered tack panel from a single source with ability to provide products of consistent quality in appearance and physical properties.
- B. Installers: Installation by skilled and experienced installers with no less than three years of documented experience installing vinyl covered tack panels of the types and extent specified for the project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver vinyl wallcoverings to the project site in unbroken and undamaged original factory wrappings and clearly labeled with the manufacturer's identification label, quality or grade and lot number.
- B. Protect fabric covered tack panels from moisture in shipment, storage and installation.
- C. Store materials inside in original undamaged packaging, in a well ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity. Lay panels flat, blocked off the floor to prevent sagging and warping. Maintain temperature in storage area above 40-degrees F.

1.10 PROJECT CONDITIONS

- A. Do not begin installation until spaces for vinyl covered tack panels have been enclosed and continuously ventilated and heating and heated to maintain substrate surface and instructions.
- B. Maintain constant recommended temperature and humidity for at least 72 hours prior to, throughout the installation period and for 72 hours after vinyl covered tack panel installation completion.
- C. Verify actual wall surfaces by accurate field measurement before fabrication.

1.11 WARRANTY

- A. Submit manufacturer's 5 year written warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 FABRIC-COVERED TACK PANELING

A. Manufacturers:

- 1. Chatfield-Clarke Co. 909-823-4297 www.chatfield-clarke.com
- 2. Lamvin Inc 760-806-6400 www.lamvin.com
- 3. ABC School Equipment 951-817-2200 www.pvsua.com
- 4. Claridge Products West 951-734-6262 www.claridgeprodusts.com
- 5. Substitutions: Section 01 25 13 "Product Options and Substitutions."

2.2 MATERIALS

A. Class 1/A Panel Substrate:

- 1. Composition: Compressed wood fiber.
- 2. Density: 16 pcf.
- 3. Weight: 0.64 pounds per square foot.
- 4. Thickness: 1/2 inch.
- 5. Size: 48 inches wide by 96 inches high. Height required to achieve seamless installation.
- 6. Fire Rating: U.L. Label.
 - a. Flame Spread: 15.
 - b. Smoke Developed: 50.
- 7. Edge Treatment: Square.
- 8. Board shall be manufactured specially as a substrate for vinyl-covered wall panels.
- 9. Board shall be asphalt-free, with an ironed-on coating.
- 10. Acceptable Manufacturers:
 - a. Chatfield-Clarke Co.; Flame resistant industrial insulation board.
 - b. LBI Boyd Wallcoverings: www.lbiboyd.com; FR Tackpanels.
 - c. Emco; www.emco.com; Standard Fiberboard Board.

- B. Fabric: Unbacked 100% polyethylene, containing no PVC, chlorine, plasticizers, heavy metals, topical finishes, harmful dyes or ozone depleting chemicals and shall not produce dioxin or hydrochloric gas in accidental fire.

- 1. Carnegie Fabrics; www.carnegiefabrics.com;
Substitutions: Section 01 25 13 – Product Options and Substitutions.
 - a. Basis of Design: Carnegie – Xorel®.

2. Pattern and Color:
 - a. Pattern: As selected by Architect from manufacturer's standard patterns.
 - b. Color: As selected by Architect from manufacturer's standard colors.

2.3 ACCESSORIES

- A. Adhesives:
 1. Panel Adhesive: Provide adhesive produced for use in application of panels over substrate.
 2. Fabric Adhesive: Provide adhesive, primer, and sealer, produced expressly for use with specified wallcovering on core specified. Provide materials which are mildew-resistant and nonstaining to wallcovering.
- B. Metal Trim: Extruded aluminum with clear anodized finish made specifically for this type of installation. Trim shall be provided with concealed mounting flange for countersunk screws. Exposed face shall be 1/2-inch maximum.
- C. Screws: 20 gauge or heavier, self-tapping drywall type steel screw.

2.4 FABRICATION

- A. Apply specified primer to selected core material as recommended by core manufacturer.
- B. Apply recommended adhesive to exposed face of core.
- C. Laminate fabric covering in numbered sequence from fabric rolls to ensure minimum color variation between tackable panels. Tack Panels must be machine laminated.
- D. Attach fabric covering to cores to produce installed panels with visible surfaces fully covered and free from bubbles, sags, wrinkles, distortion of fabric covering, adhesive or foreign material.
- E. Wrap panel substrate with fabric, covering vertical edges and returning fabric approximately 2 inches on back of panel. No fabric seams will be permitted within a panel face.
- F. Provide sizes for panel configurations to match heights and widths as indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install in strict accordance with Manufacturer's installation instructions. Use recommended adhesive and concealed fasteners.
- B. Uniformly spread adhesive to wall surface and tackboard panels and press panels to wall surface. Install panels to the wall surface in one piece from floor to ceiling or extent as indicated on drawings. Install panels plumb and level to fit snugly to the walls so that there is no movement when pressure is applied at any surface point.
- C. All vertical joints shall be butt joints with machine wrapped vinyl fabric around edge of fiberboard.

- D. Joint Layout: Locate as indicated. Where not indicated, no panel width shall be less than 18-inches wide.
- E. Align faces carefully to provide a plane surface, plumb, level and true.
- F. Install panels in one piece beginning at center point of the wall and working to room corners.
- G. Install tack board panels in exact order as they are manufactured from the vinyl covering bolt.
- H. Install vinyl covered tack panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, field fabricated to fit adjoining work accurately at the borders and wall penetrations.
- I. Metal Trim: Use maximum lengths possible. Install trim at all exterior corners, interior corners, all locations where panels abut other materials, and at locations where indicated. Stop vertical trim at top of rubber base.

3.2 CLEANING AND COMPLETION

- A. Clean tack board panels upon completion of installation to remove any foreign materials or adhesive in accordance with fabric cleaning instructions.
- B. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the tackboard panel installation. Leave areas in neat clean and orderly condition.

END OF SECTION

08/27/18

SECTION 09 84 33

SOUND ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Custom fabricated acoustical wall panels – Type AWP-1.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 09 51 13 – Acoustical Panel Ceilings.
2. Section 09 29 00 – Gypsum Board.
3. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

B. ASTM International:

1. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Surface Burning Characteristics (ASTM E84):
 - a. Fire Test Data: Class A per ASTM E84.
 - b. Flamespread: 25 maximum.
 - c. Smoke Developed: 450 maximum.
 - d. Fire ratings for all fabric covered panels is based on testing of the panel wrapped with the standard in stock fabric, Guilford of Maine, Model FR 701.

1.5 SUBMITTALS

A. Product Data: Submit product data sheet, for specified products.

- B. Shop Drawings: Submit shop drawings showing layout, edge profiles and panel components, including anchorage, accessories, finish colors and textures.
- C. Samples: Submit selection and verification samples of finishes, colors and textures.
- D. Installation Instructions: Submit manufacturer's installation instructions.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Test Reports: Certified test reports showing compliance with specified performance requirements.
 - 1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting.

1.7 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical wall panels and method of attachment by a single manufacturer.
- B. Coordination of Work: Coordinate acoustical wall panels work with installers of related work including, but not limited to suspended ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.8 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Section 01 66 00 "Product Delivery, Storage and Handling."
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions. Environmental conditions required for storage are the same as for installation, see paragraph 1.9.A.

1.9 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install panels until wet work, such as concrete and plastering, is complete; the building is enclosed; and the temperature and relative humidity are stabilized at 60 - 80 degrees F and 35% minimum RH and 55% maximum RH, respectively. All products constructed with wood or wood fiber content must be stored for at least 72 hours in the controlled environment specified herein prior to installation to allow the materials to stabilize.

PART 2 - PRODUCTS

2.1 ACOUSTICAL WALL PANELS – TYPE AWP-1

- A. Manufacturers:
 - 1. Kinetics Noise Control; www.kineticsnoise.com.
 - 2. G&S Acoustics; www.gsacoustics.com

3. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: Kinetics Noise Control; High Impact HardSide Panels.

2.2 MANUFACTURED UNITS

- A. High Impact HardSide Panels:
 1. Thickness: 2 inches.
 2. Size: As indicated on the drawings up to a maximum 48 inch x 120 inch panel.
 3. Core: 2 inch thick fiberglass, 6 - 7 pcf density, with bonded facing layer of 12 pcf, 1/8 inch thick impact resistant fiberglass.
 4. Edge Detail: Square, hardened with non-resin, Class A hardening solution.
 5. Facing: 100% polyester fabric, FR 701 Style 2100 by Guilford of Maine. Designer selected fabrics must be approved by the panel manufacturer as acceptable quality for wrapping and covering core materials. Some fabrics are unstable, too stiff, or lack the weight and thread density for producing an acceptable finish product.
 - a. Color: As selected by Architect from fabric manufacturer's full range of colors.
 6. Sound Absorption (ASTM C423): Noise Reduction Coefficient as follows:
 - a. 2 inch Panel: 1.00, minimum.
 7. Mounting Accessories: Z-brackets.
- B. Drawing Designation: Type AWP-1.

2.3 FABRICATION

- A. General: Treat fabric wrapped panels using heat shrink process to develop fully taut facing.
- B. High Impact HardSide Panels: Wrap panel edges and return facing fabric 1 - 2 inches on back of panel. Secure fabric with adhesive applied to edges and back of panel only.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
 1. Verify that stud spacing is 16 inches on center, maximum, for panels installed over open studs.

2. Do not install panels until unsatisfactory conditions are corrected.

3.3 PREPARATION

- A. Measure each wall area and establish layout of acoustical wall panels and installation hardware. Coordinate panel layout with wall-mounted mechanical and electrical components.
- B. Wall prep and painting of wall substrate behind acoustical wall panels shall be provided by Section 09 91 00.

3.4 INSTALLATION

- A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align and level fabric pattern and grain among adjacent units.

3.5 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clip loose threads; remove pills and extraneous materials.
- C. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

09/21/18

SECTION 09 84 36

BEAM AND BAFFLE METAL CEILING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Perforated metal ceiling beams.
2. Acoustical backing.
3. Suspension systems.
4. Accessories; provide other necessary items including devices for attachment to overhead construction, secondary members, splines, splices, connecting clips, and other devices required for a complete installation.
5. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support direct-hung beam and baffle metal ceiling suspension system.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections / Work:

1. Sections 09 51 13 - Acoustical Panel Ceilings.
2. Sections 09 91 00 - Painting.
3. Division 23 - Heating, Ventilating and Air Conditioning.
4. Division 26 - Electrical.

D. This Section covers the general requirements only for Beam and Baffle Metal Ceilings as shown on the drawings. The supplying and installation of additional accessory features and other items not specifically mentioned herein, but which are necessary to make a complete installation, shall also be included or clarified accordingly.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)
Ceilings & Interior Systems Construction Association (CISCA)

B. ASTM International:

1. ASTM C636 – Recommended Practice for Installation of Metal Ceiling Suspensions Systems for Acoustical and Lay-in Panels.
2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E580 – Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's published literature, including specifications.
- B. Product Certification: Manufacturer's certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.
- C. Shop Drawings: Submit shop drawings for reflected ceiling plans (RCP's), drawn to scale, and indicating penetrations and ceiling mounted items. Show the following details:
 - 1. Reflected Ceiling Plan(s): Indicating metal ceiling beam layout, ceiling mounted items and penetrations.
 - 2. Suspension System, Carrier and Component Layout.
 - 3. Details of system assembly and connections to building components.
- D. Samples for Verification: Full-size units (or as specified below) of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.
 - 1. 2" x 6" beam x 12" length, with panel end cap and acoustical insulation.
 - 2. 10" long samples of each suspension component.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. Test Reports: Certified reports from independent agency substantiating structural compliance to governing requirements.
 - 2. Certificates:
 - a. Data substantiating manufacturer and installer qualifications.
 - b. Certified data attesting fire rated materials comply with specifications.
 - 3. Manufacturer's Instructions: Detailed installation instructions and maintenance data.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Instructions: Provide manufacturer's standard maintenance and cleaning instructions for finishes provided.

1.6 QUALITY ASSURANCE

- A. Manufacturer/Installer Qualifications:
 - 1. Provide beam and baffle metal ceiling system components produced by a single manufacturer with a minimum 5 years' experience in actual production of specified products and with resources to provide consistent quality in appearance and physical properties, without delaying the work.
 - 2. Provide suspension system components produced by a single manufacturer to provide compatible components for a complete metal ceiling system installation.
 - 3. Perform installations using a firm with installers having no less than 3 years of successful experience on projects of similar size and requirements.
- B. Regulatory Requirements:
 - 1. Fire Rating Performance Characteristics: Install system to provide a flame spread of 0 - 25, complying with certified testing to ASTM E 84.

2. Structural Criteria: Install and certify system to comply with structural requirements of governing codes.
 3. Installation Standard for Suspension System: Comply with ASTM C 636.
 - C. Mock-Up: Prior to beginning installation erect a mock-up section, where directed, using all system components.
 - D. Pre-installation Conference: Conduct a conference, prior to start of installation, to review system requirements, shop drawings, and all coordination needs.
- 1.7 DELIVERY, STORAGE AND HANDLING
- A. Deliver system components in manufacturer's original unopened packages, clearly labeled.
 - B. Store components in fully enclosed dry space. Carefully place on skids, to prevent damage from moisture and other construction activities.
 - C. Handle components to prevent damage to surfaces and edges, and to prevent distortion and other physical damage.
- 1.8 PROJECT CONDITIONS
- A. Begin system installations only after spaces are enclosed and weather-tight, and after all wet work and overhead work have been completed.
 - B. Prior to starting installations, allow materials to reach ambient room temperature and humidity intended to be maintained for occupancy.
- 1.9 WARRANTY
- A. Provide specified manufacturer's warranty against defects in workmanship, discoloration, or other defect considered undesirable by the Architect.
 - B. This warranty shall remain in effect for a minimum period of one (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide Tavola™ Prime Beam and Baffle ceiling system manufactured by Hunter Douglas Architectural, Inc., 5015 Oakbrook Parkway, Suite 100, Norcross, GA 30093, USA. (800) 366-4327. www.HunterDouglasCeilings.com
- B. Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.2 SYSTEM MATERIALS

- A. Tavola™ Prime Beam and Baffle ceiling system for interior installations providing single beam access with use of scissor clips. Material thickness per manufacturer's recommendations.
 1. Beam Dimensions:

- a. 2" wide by 6" high.
 - b. 2" wide by 12" high.
- 2. Beam Spacing 18" and 24", as indicated.
- 3. Beam Length (max. 12' - 0"): as indicated.

B. Suspension:

- 1. Grid: 15/16" heavy-duty T-grid.
- 2. Hanger Bracket Assembly: Scissor-clip beam attachment.

C. Perforations available on painted finish options only:

- 1. Perforation Pattern: #115, on vertical sides of beam only.

D. Panel Finish: To be selected by Architect from manufacturer's full line of paint, film, and wood veneer finishes.

- 1. Paint; color to be selected by Architect.
 - a. Applied Polyester.
 - b. Powder Coat.
 - c. Decorated Wood-Look Powder Coat.
- 2. Film (0.025", interior only).
- 3. Wood Veneer (interior and non-perforated only).

2.3 ACCESSORY MATERIALS

A. Panel End Caps: End caps to match beam finish.

B. Hanger Brackets: Splice/hanger bracket connectors.

C. Acoustic Material: Non-woven black fabric with 1.5" thick glass fiber, 1-1/2 pcf density, polywrapped.

- 1. Apparent NRC Rating: 1.05.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical beam and baffle metal beams attach or abut, with installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of metal beam and baffle ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Measure each ceiling area and establish layout of acoustical metal beam and baffle units to balance border widths at opposite edges of each ceiling. Comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical metal beam and baffle ceiling system, per manufacturers shop drawings provided, per manufacturer's written instructions and to comply with publications referenced below.
1. CISCA "Ceiling Systems Handbook"
 2. Standard for Ceiling Suspension System Installations - ASTM C 636
 3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E 580
 4. IBC (International Building Code) Standard for Seismic Zone for local area.
- B. Suspend ceiling hangers from building's structural substrates and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produce hanger spacings that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Utilize supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Where used, secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Space hangers not more than 48" on-center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 12" from ends of each member. Supply supporting calculations from licensed Structural Engineer verifying hanger spacing meets all requirements, when spacing exceeds those recommended.
 6. Level grid to 1/8" in 10' from specified elevation(s), square and true.
 7. Adjust suspension system runners so they are square (within 0.5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- C. Secure bracing wires to ceiling suspension members and to supports acceptable to Architect and/or IOR. Suspend bracing from building's structural members and/or structural deck, as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs (unless directed otherwise).
- D. Install acoustical metal beam and baffle units in coordination with suspension system.
1. Align joints in adjacent beams to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated. Beam joints shall flow smoothly and in a straight line within 1/8" in 10'. Intersections shall be continuous.
 2. Fit adjoining units to form flush, tight joints.
 3. Remove protective film from beams only when space is completely clean and free of airborne particles. Use white cotton gloves for final installation of beams into support system.

3.4 ADJUST AND CLEAN

- A. Adjust components to provide uniform tolerances.

- B. Replace all ceiling beams that are scratched, dented or otherwise damaged.
- C. Clean exposed surfaces with non-solvent, non-abrasive commercial type cleaner.

END OF SECTION

01/04/19

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing of materials and equipment and completion of painting and painter's finish on exposed exterior and interior surfaces as required to complete the painting and finishing as indicated and specified.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates.
 - 2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.2 DEFINITIONS

- A. Blocking: Two painted surfaces sticking together such as a painted door sticking to a painted jamb.
- B. PDCA: Painting & Decorating Contractors of America www.pdca.org.
- C. SSPC: Scopes of SSPC Surface Preparation Standards and Specifications. www.sspc.org.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: Prepare samples of colors and textures based upon the Architect's selections and submit them for review.
 - 1. Painted Wall Samples: Prepare on 8" by 10" matt board in a stair step manner so all required coats show.
 - 2. Painted Wood Samples: Prepare on clear Douglas fir or pine 1" by 4" by 12" long strips, arranged in a stair step manner so all required coats show.
 - 3. Stain Finish Samples: Prepare on a 1" by 4" by 12" long sample of the surface type scheduled for staining.
 - 4. Clear Wood Finish Samples: Prepare on a 1" by 4" by 12" long sample of the surface type scheduled for clear finish.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- B. Quantity: Furnish Owner with an additional 3 percent, but not less than one gallon of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. The intent and requirements of this section, is that materials, items and surfaces which are normally painted and finished in construction of this type and quality, shall be so included, whether or not said materials, items or surfaces are specifically called out and included in the schedules and notes on the drawings, or is, or is not, specifically mentioned in these specifications.
- C. The following general categories of construction and items are included under other sections, and shall not be a part of this section:
 - 1. Shop prime painting of structural and miscellaneous iron or steel.
 - 2. Shop prime painting of hollow metal.
 - 3. Shop finished construction and items.
- D. Paint exposed mechanical, plumbing and electrical construction, which is not factory finished.
- E. The Room Finish Schedules indicated, show the location of interior room surfaces to be painted or finished. The schedule indications are general and do not necessarily define the detail requirements. Include detailed refinements and further instructions as may be given for the required complete finishing of spaces and rooms.
- F. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in paint products shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery:

1. Deliver paint in manufacturer's labeled and sealed containers. Labels shall include manufacturer's name, brand, type, batch number, color of paint and instructions for reducing. Thin only in accordance with printed directions of manufacturer. Thinning shall comply with the regulations of the air pollution control district having jurisdiction.
 2. Do not deliver or use materials other than those specified, or approved.
- B. Storage and Handling: Store paint materials and equipment, when not in actual use, in places specifically assigned for that purpose. Ventilate storage space and provide fire protection. Mix and handle paint in these assigned areas; use metal containers for mixing and handling and designed for safety. Remove paint materials, including rags, tarpaulins, mixers, and empty containers and filled or partially filled containers from the building areas at the close of each working day.
- 1.6 FIELD CONDITIONS
- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F
 - B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - C. Examine the drawings and the specifications of other trades and consult with the other trades to determine the full extent of surfaces and items that are specified to include shop priming and shop finish painting.
- 1.7 WARRANTY
- A. Provide an extended warranty under the provisions of Section 01 78 36.
 - B. Warrant painting and finishing against peeling, fading, cracking, blistering, or crazing for a period of 2 years from the date of "Substantial Completion". The written warranty shall include materials and labor. The warranty shall be signed by the paint manufacturer, the painter and the Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products listed from one of the following manufacturers for the paint category indicated.
 1. Benjamin Moore.
 2. Dunn-Edwards Corp.
 3. PPG Paints.
 4. Kelly-Moore Paint Co.
 5. Sherwin-Williams Co.
- B. Primer and sealer coats may be thinned no more than 10 percent, with paint manufacturer's thinner. Use other materials as they come from the can, except as otherwise approved.
- C. Secure the Color Schedule before undercoating. Unless otherwise specified, tint undercoats slightly to approximate the color of the finish coat. Obtain approval of colors before proceeding with the finishing operations.

- D. Where a specific name is not given for a product or ingredient, provide item of the best quality of the approved manufacturer, which is normally used for the intended purpose.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, is prohibited.

2.3 COLOR SELECTION

- A. The Architect will select the finish colors and determine the basic hues of all surfaces to be painted or finished.
- B. Colors: Custom colors as selected by the Architect.
- C. After the actual painting and finishing has started, the Architect retains the right to make minor modifications in tone and shade on the various surfaces to suit the actual lighting conditions encountered. Submit additional samples, as required, to assist the Architect in his final selection.
- D. The number of colors to be used in any given room or space, and on the entire project, will be determined by the Architect.

2.4 MATERIALS

- A. Substitutions: Materials will be considered for substitution subject to requirements specified in Section 01 25 13. Submit chemical formulations of materials proposed for substitution to demonstrate that formulation of substitution is similar to formulation of specified product; or results of test showing that performance of substitution is equivalent to performance of specified product.
- B. Acceptable Products: Unless otherwise specified in the Paint Schedule, acceptable products include the following or equal:
 - 1. Galvanized Metal Primer:

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn-Edwards Corp.; UGPR00 Ultra-Grip
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)
Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer/Finish
Sherwin Williams Co.; B66 Pro Industrial Pro-Cryl Universal Acrylic Primer

2. Ferrous Metal Primer:

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn-Edwards Corp.; BRPR00-1 Bloc-Rust
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)
Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer/Finish
Sherwin-Williams Co.; Pro Industrial ProCryl Universal Metal Primer B66-310

3. Aluminum Primer:

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn-Edwards Corp.; ULGM00, Ultrashield, Int./Ext. Galvanized Metal Primer
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)
Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer/Finish
Sherwin-Williams Co.; Pro Industrial ProCryl Universal Metal Primer B66-310

4. Concrete and Plaster Primer - Exterior:

Benjamin-Moore; 066 Acrylic Masonry Sealer
Dunn-Edwards Corp.; ESPR00 Eff-Stop
PPG Paints; 6001 Hydro-Sealer (86.4 g/L VOC)
Kelly-Moore Paint Co.; 247 Acry-Shield 100% Acrylic Masonry Primer
Sherwin-Williams Co.; Loxon Exterior Acrylic Masonry Primer A24 Series

5. Intermediate Metal Undercoat - Exterior:

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn Edwards: N/A
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)
Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer/Finish
Sherwin-Williams Co.; Pro Industrial ProCryl Universal Metal Primer B66-310

6. Acrylic Enamel Undercoat - Interior:

Benjamin-Moore; 253 Moorcraft Superspec Latex Enamel Undercoat
Dunn-Edwards Corp.; IKPR00 Interkote
PPG PAINTS; 1000 Prep & Prime Enamel Undercoater (92.6 g/L VOC)
Kelly-Moore Paint Co.; 973 Acry-Plex ZERO VOC Interior Wall Primer Undercoat
Sherwin-Williams Co.; ProMar 200 Zero Primer B282600

7. Vinyl Acrylic Sealer:

Benjamin-Moore; 534 Ultra Spec 500 Interior Latex Primer
Dunn-Edwards Corp.; VNPR00 Vinylastic
PPG Paints; 1000 Hi Hide Interior Primer Sealer (92.6 g/L VOC)
Kelly-Moore Paint Co.; 971 Acry-Plex Zero VOC Interior PVA Primer/Sealer
Sherwin-Williams Co.; Premium Wall & Wood Primer B28

8. Acrylic Gloss Enamel:

Benjamin-Moore; Ultra Spec EXT 449 Gloss Finish
Dunn-Edwards Corp.; EVSH60 Evershield Gloss
PPG Paints; 3028N Ultra-Hide 250 Int/Ext Gloss Enamel (34 g/L VOC)
Kelly-Moore Paint Co.; Devcyl 1449 Waterborne Gloss
Sherwin-Williams Co.; A-100 Acrylic Gloss A8 Series

9. Acrylic Finish Coat - Flat - Exterior:

Benjamin-Moore; 447 Ultra Spec EXT Flat Finish
Dunn-Edwards Corp.; EVSH10 Evershield Flat / SSSL10 Spartashield Flat
PPG PAINTS; 2200XI Fortis 350 Exterior Flat (49.25 g/L VOC)
Kelly-Moore Paint Co.; 1200 Premium Professional Exterior 100% Acrylic Flat
Sherwin-Williams Co.; A-100 Exterior Latex A6

10. Acrylic Enamel-Non Blocking - Low Sheen - Interior:

Benjamin-Moore; Advance Satin Waterborne Alkyd 792
Dunn-Edwards Corp.; SPMA40 Suprema Low Sheen
PPG Paints; 1402N Ultra Hide-250Non-Blocking Eggshell (50 g/L VOC)
Kelly Moore Paint Co.; 1610 Acry-Plex 100% Acrylic Eggshell Enamel
Sherwin-Williams Co.; Pro Industrial Waterbased Alkyd Urethane Enamel B53

11. Acrylic Latex Enamel - Semi-Gloss - Interior:

Benjamin-Moore; 539 Ultra Spec 500 Semi-Gloss
Dunn-Edwards Corp.; SPMA50 Suprema Semi-Gloss / SZRO50 SpartaZero
PPG PAINTS; 6-4510XI Speedhide Zero Semi-Gloss Enamel (Zero VOC)
Kelly-Moore Paint Co.; 1050 Premium Professional Semi-Gloss Enamel
Sherwin-Williams Co.; Pro Industrial Waterbased Alkyd Urethane Enamel B53

12. Acrylic Enamel-Non Blocking - Semi-Gloss - Interior:

Benjamin-Moore; EcoSpec W/B Semi Gloss 376
Dunn-Edwards Corp.; EVSH50 Evershield Semi-Gloss
PPG PAINTS; 3028N Ultra-Hide 250 Int/Ext Gloss Enamel (34 g/L VOC)
Kelly-Moore Paint Co.; 1650 Acry-Plex 100% Acrylic Interior Semi-Gloss Enamel
Sherwin-Williams Co.; Solo Semi Gloss A76W0051

13. Wood Stain - Interior:

Benjamin-Moore/Lenmar; Waterborne Wiping Stain 1WB.1300
Dunn-Edwards Corp.; Old Masters Water-based Wood Stain
PPG PAINTS Deft DFT300 Waterborne Stain (>250 g/L VOC)
Kelly-Moore Paint Co.; Woodcraft 2700 100 VOC Series Stain-Gem-Glo Wiping Stain
Sherwin-Williams Co.; Wood Classics Interior Stain A48-200 Series

14. Sanding Sealer - Light Wood - Interior:

Benjamin-Moore/Lenmar; Self Sealing
Dunn-Edwards Corp.; VALPRO, Sanding Sealer (NAS2750)
PPG Paints; Gemini Pre-Cat 275 VOC Series Clear Lacquer (265 g/L VOC)
Kelly Moore Paint Co.; 4623 Clear Lacquer Sanding Sealer – Gemini Pre-Cat 275 VOC Series Sanding Sealer
Sherwin-Williams Co.; Low VOC Acrylic Lacquer Sanding Sealer Wood Classics

15. Semi-Gloss Lacquer - Interior Light Wood:

Benjamin-Moore/Lenmar; Megavar Waterborne Acrylic Lacquer 1WB.500 Series
Dunn-Edwards Corp.; VALPRO, NAF2756 (60 Sheen) Semi-Gloss
PPG Paints; Gemini Pre-Cat 275 VOC Series Clear Lacquer (265 g/L VOC)
Kelly Moore Paint Co.; 4824 275 VOC Semi-Gloss Precatalyzed Lacquer- Gemini Pre-Cat 275 VOC Series Semi-Gloss Lacquer
Sherwin-Williams Co.; Low VOC Water White Lacquer Semigloss Wood Classics

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Portland Cement Plaster: 12 percent.
 - 5. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured, including pH testing to determine that alkalinity is within limits established by the manufacturer.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- E. Gypsum Board Substrates: Verify that finishing compound is sanded smooth
- F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions, including pH testing to determine that alkalinity is within limits established by the manufacturer.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 - 1. SSPC-SP 1, "Solvent Cleaning."
 - 2. SSPC-SP 2, "Hand Tool Cleaning."
 - 3. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates:
 - 1. Clean all galvanized metal with an appropriate Metal Prep and Passivator Remover.
 - 2. To ensure passivators removal, perform the following test:
 - a. With a 2% to 5% copper sulfate solution, place a swab or droplets on the prepared area. If the copper sulfate causes the galvanized to blacken, passivator has been removed and is ready for paint applications.
 - b. If the copper sulfate has no effect on the galvanized, continue with metal prep solution OR use a Scotch Pad to abrade it being careful not to remove the galvanization itself.
 - 3. Then apply required primer, allow drying as described in the product data sheets and test adhesion prior to applying finish coat(s).
- H. Aluminum Substrates: Remove loose surface oxidation.
- I. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied at no additional cost to the Owner, to completely hide base material, provide uniform color, and to produce satisfactory finish results.
 - 3. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
 - 4. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 5. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 6. Paint exposed and semi-exposed surfaces of stops and mouldings at hollow metal frames with glazed lites before installation of glazing; paint exposed screw heads at stops and mouldings after installation.
 - 7. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 8. Priming may not be required on items delivered with prime or shop coats, unless otherwise specified. Touch up prime coats applied by others as required ensuring an even primed surface before applying finish coat.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Tanks that do not have factory-applied final finishes.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PAINTING SCHEDULE

- A. Exterior Surfaces:
 1. Galvanized Metals - Gloss: (Galvanized surfaces exposed to sight and/or weather, unless indicated to be unpainted).

1 coat Galvanized Metal Primer
2 coats Acrylic Gloss Enamel
 2. Iron and Steel - Gloss: (All other iron and steel surfaces exposed to sight and/or weather).

2 coats Ferrous Metal Primer*
1 coat Intermediate Metal Undercoat - Exterior
1 coat Acrylic Gloss Enamel

*Omit first coat on shop-primed surfaces.
 3. Aluminum - Gloss: (All surfaces not indicated or specified to receive factory finish).

1 coat Aluminum Primer
1 coat Intermediate Metal Undercoat - Exterior
1 coat Acrylic Gloss Enamel

4. Wood - Painted Semi-Gloss:
 - 1 coat Wood Primer - Exterior
 - 2 coats Wood Trim Enamel - Semi-Gloss
5. Concrete - Painted Flat:
 - 1 coat Concrete and Plaster Primer - Exterior
 - 1 coat Acrylic Finish Coat - Flat - Exterior
6. Integrally Colored Cement Plaster:
 - 1 coat Concrete and Plaster Primer - Exterior
 - 1 coat Acrylic Finish Coat - Flat – Exterior

B. Interior Surfaces:

1. Steel Door Frames - Non-Blocking Semi-Gloss:
 - 1 coat Ferrous Metal Primer*
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 1 coat Acrylic Enamel-Non Blocking - Semi-Gloss - Interior

*Omit 1st coat on shop-primed surfaces.
2. Metals - Acrylic Latex Enamel Semi-Gloss: (All other metals Including exposed piping, conduit, electrical panels, miscellaneous brackets, bolts, fasteners, supports, prime coated hardware, casing beads, metal grilles and exposed ducts etc., other than plated or factory finished items).
 - 1 coat Ferrous Metal Primer*
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 1 coat Acrylic Latex Enamel - Semi-Gloss - Interior

*Omit 1st coat on shop-primed surfaces.
3. Gypsum Board - Low Sheen:
 - 1 coat Vinyl Acrylic Sealer
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 1 coat Acrylic Enamel-Non Blocking - Low Sheen - Interior
4. Gypsum Board - Acrylic Latex Enamel Semi-Gloss:
 - 1 coat Vinyl Acrylic Sealer
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 1 coat Acrylic Latex Enamel - Semi-Gloss - Interior
5. Hardwood Trim - Stained:
 - 1 coat Wood Stain - Interior
 - 1 coat Sanding Sealer - Interior
 - 2 coats Semi-Gloss Lacquer - Interior
6. Wood - Acrylic Latex Enamel - Semi-Gloss:
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 2 coats Acrylic Latex Enamel - Semi-Gloss - Interior

7. Miscellaneous: Construction visible through screen vents and grilles shall have one heavy coat of flat black paint.

END OF SECTION

03/29/19

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Porcelain enamel markerboards.
 - 2. Horizontal sliding units.
 - 3. Vinyl-fabric-faced cork tackboards.
 - 4. Aluminum trim and accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Product Supplied But Not Installed Under This Section:
 - 1. Horizontal Sliding Visual Display Units are supplied under this section and installed under Section 06 41 16 as part of the typical teaching wall casework.
- D. Related Sections:
 - 1. Section 09 22 16 "Non-Structural Metal Framing" for blocking in walls for anchorage of visual display surfaces.
 - 2. Section 09 77 23 "Fabric Covered Tack Paneling" for tackable, fabric-covered panels mounted on walls.

1.2 REFERENCES

- A. The editions of standards and specifications published by the following organizations, and referenced herein, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
 - Aluminum Association (AA)
 - American Society for Testing and Materials (ASTM)
 - American National Standards Institute (ANSI)
 - U.S. General Services Administration (Fed. Spec.)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
 - 2. Include individual panel weights for sliding visual display units.
- B. Shop Drawings: For visual display units.
 - 1. Include plans, elevations, sections, details, and attachment to other work.
 - 2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.

3. Show locations and layout of special-purpose graphics.
 4. Include sections of typical trim members.
- C. Samples: Submit full range of color samples for each type of markerboard, tackboard, trim and accessory required. Provide 12-inch square samples of sheet materials and fabric swatches and 12-inch lengths of trim members for color verification after selections have been made. Submit fabric swatches of fabric facings for tackboards.
- D. Product Schedule: Submit schedule of visual display units. Use same designation indicated on Drawings.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATION SUBMITTALS

- A. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units, to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide vinyl fabric faced tackboards with surface burning characteristics specified below, as determined by testing assembled materials composed of facings and backings identical to those specified herein, in accordance with ASTM E84, by a testing organization acceptable to the State Fire Marshal.
1. Flame Spread: 25 or less.
 2. Smoke Developed: 10 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.
- B. Wrap or otherwise package markerboard and tackboard components for protection against damage during shipment and storage.
- C. Store components in a clean, dry storage area as packaged by the manufacturer, with manufacturer's seals and labels intact. Store porcelain enameled steel markerboard panels on edge in a manner to prevent bowing, warping or other irregularities.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.
 - 1. Warranty Period: "Life of Building" warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers or equal:
 - Claridge Products and Equipment, Inc.; www.claridgeproducts.com
 - Platinum Visual Systems™; www.pvsusa.com
 - Chatfield-Clarke Co., Inc.; www.chatfield-clarke.com
 - Newline Products, Inc.; www.newlineproduct.com
 - Substitutions: Section 01 25 13 "Product Options and Substitutions."

2.2 VISUAL DISPLAY BOARD ASSEMBLY

- A. Visual Display Board Assembly: Factory fabricated.
 - 1. Assembly: Markerboard.
 - 2. Corners: Square.
 - 3. Width: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
- B. Markerboard Panel: Porcelain-enamel faced markerboard panel on core indicated.
 - 1. Color: As selected by Architect.
- C. Aluminum Frames and Trim: As specified in Article 2.5.
- D. Special-Purpose Graphics: Fuse or paint music staff lines graphic onto surface of visual display unit, in locations indicated.

2.3 MARKERBOARD PANELS

- A. Porcelain Enamel Markerboard Panels: Balanced, high pressure, factory-laminated markerboard assembly of three-ply construction; consisting of moisture-barrier backing,

core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

- B. Face Sheet: ASTM A424, enameling grade steel sheet coated on exposed face with 3 coat process of primer, ground coat and color cover coat, and on concealed face with 2 coat process of primer and ground coat. Fuse cover and ground coats to steel at firing temperatures standard with manufacturer, but not less than 1200 degrees F.
 - 1. Finish: Low gloss finish for use with dry-erase markers that wipe clean with dry cloth or standard eraser, and that is suitable as a projection screen.
 - 2. Proprietary Facing Sheet: At Contractor's option, "Writanium®" 28 gauge steel face with porcelain enamel finish by Platinum Visual Systems; or "LCS-II" porcelain enamel clad, Type 1 stretcher-leveled aluminized steel face sheet, by Claridge Products and Equipment, Inc. may be provided in lieu of facing sheet construction specified above. Fuse porcelain enamel coating to steel at approximately 1000 degrees F (538 degrees C).
 - 3. Facing Sheet Thickness: 24-gage.
 - 4. Cover Coat Finish: Special writing surface with gloss finish intended for use with manufacturer recommended fast drying liquid felt-tipped markers. Color: As selected by Architect.
- C. Core: Particleboard complying with ANSI A208.1-1989, Grade 1-M-1, nominal 1/2-inch thick.
- D. Backing Sheet: Aluminum sheet, 0.005-inch thick.
- E. Laminating Adhesive: Manufacturer's standard moisture resistant thermoplastic type.
- F. Special-Purpose Graphics: Fuse or paint music staff lines graphic onto surface of porcelain-enamel visual display unit, in locations indicated.

2.4 HORIZONTAL SLIDING UNITS

- A. Horizontal-Sliding Visual Display Units: Factory-fabricated units consisting of extruded-aluminum tubular frame, aluminum-framed horizontal-sliding visual display panels, and extruded-aluminum fascia that conceals overhead sliding track; designed for recessed mounting. Provide panels that operate smoothly without vibration or chatter.
 - 1. Basis-of-Design Product: Platinum Visual Systems™, WHS Series.
 - 2. Metal trim and accessories: WHS Series aluminum extrusions with clear satin anodized finish.
 - a. Top Track HS500: One piece top track with integral fascia.
 - b. Bottom Track HS550: Standard channel bottom track to accept nylon guide.
 - c. Chalktray CR310: Standard continuous solid chalktray with ribbed section and smoothly curved ends.
 - d. Map rail MR421: Standard 2" high continuous rail with colored cork insert as follows:
 - 1) End stops: One pair per map rail.
 - 2) Map hooks: One every 2' of map rail.
 - 3) Roller brackets: One pair per map rail.
 - 4) Flag holder: One per room.
 - 3. Sliding Markerboard, Chalkboard and/or Tackboard Panels:
 - a. Frame CH215: Standard channel frame with 3/4" face.

- b. Nylon Rollers: Two per panel up to 4' wide and three per panel up to 8' wide.
 - c. Nylon Guides: Two per panel up to 4' wide and three per panel up to 8' wide.
 - d. Finger Pulls: One pair per sliding panel.
- 2. Two-Track Units: Fabricate unit with fixed rear panel covering entire rear surface. Provide two sliding panels, each equal to not less than one-half of overall length of unit.
- 3. Three-Track Units: Fabricate unit with fixed rear panel covering entire rear surface. Provide three sliding panels, each equal to not less than one-third of overall length of unit.
- 4. Fixed Back Markerboard Panel.
- 5. Size: As shown on drawings.
- 6. Color: White.

2.5 TACKBOARDS

- A. Construction: Vinyl fabric laminated to 1/4-inch thick natural or plastic sealed cork over 1/4 inch thick hardboard backing.
- B. Vinyl Fabric: Mildew-resistant, washable, meet the requirements of Fed. Spec. CCC-W-408A, Type II, weighing not less than 22-ounces per lineal yard 54-inches wide. Provide fabric that has a flame spread rating of 25 or less when tested in accordance with ASTM E84.
 - 1. Vinyl Fabric: As specified in Section 09 77 23 "Fabric Covered Tack Paneling."
 - 2. Color, Pattern, and Texture: As selected by Architect from manufacturer's standard selection.
- C. Backing: Make panels rigid by factory laminating face sheet under pressure to 1/4-inch thick hardboard backing.

2.6 ALUMINUM TRIM AND ACCESSORIES

- A. Fabricate frames and trim of not less than 0.062 inch thick, 6063-T5 alloy aluminum extrusions. Provide trim in straight single lengths wherever possible, keep joints to a minimum. Miter corners to a neat, hairline closure.
 - 1. Finish: Clear anodized finish meeting the requirements of AA designation M12C22A31.
- B. Field Applied Trim: Manufacturer's standard slip-on trim.
- C. Chalktray: Manufacturer's standard ribbed section, solid extrusion with exposed ends smoothly curved. Provide chalktray under all markerboards and tackboards.
- D. Map Rails: Integral part of top edge angle, continuous at top of all markerboards and tackboards. Provide the following accessories:
 - 1. Display Rail: Continuous 1-inch wide cork display rail integral with map rail.
 - 2. End Stops: One at each end of each map rail.

3. Map Hooks with Flexible Metal Clips: Two for each 4 foot of map rail or fraction thereof.
4. Roller Shade Brackets: Two for each 4 foot of map rail or fraction thereof.
5. Flagholder: One for each room.

2.7 FABRICATION

- A. Assembly: Provide either factory-assembled or field-assembled markerboard and tackboard units.
- B. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
- C. Splice rails shall be manufacturer's standard "H" sections designed to receive and lap board on both edges along vertical butt joints. Exposed face of splice rail shall be colored to match adjacent board. No butt joints will be permitted in boards less than 16 feet in length.
- D. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards.
- E. Horizontal Sliding Units: Fabricate panels from the manufacturer's standard components.
 1. Laminate facing sheet and backing sheet to core material under pressure, using manufacturer's recommended adhesive.
 2. Provide factory-assembled visual display boards, except where sizes demand partial field assembly.
 3. Assemble units in one piece without joints, wherever possible. Where required dimensions exceed maximum panel size available, provide two or more pieces of equal length, as indicated on approved shop drawings. Assemble to verify fit at factory, then disassemble for delivery and final assembly at project site.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Assembled Units: Deliver factory-assembled markerboard and tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefabricate components at the factory, disassemble for delivery, and make final joints at the project site. Use splines at joints to maintain surface alignment.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.
- E. Sliding Visual Display Units: Install units at mounting heights indicated. Attach to wall framing with fasteners at not more than 16 inches on center.

1. Adjust panels to operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- F. Aluminum Trim: Provide neat, tightly closed, bend-around mitered corners, spliced only if over 16 foot lengths, with no single piece less than 4 feet in length. Fasten to walls with concealed fasteners as recommended by the manufacturer.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION

09/21/18

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior room identification signs.
 - 2. Exterior and interior directional, informational, and safety signs.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard referenced in paragraph 1.6.A.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit product data for specified products. Include material details for each sign specified.
- B. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign.
- C. Samples: One sample of each type of sign. Each sample shall consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Two samples of manufacturer's standard color chips or color chart for each material requiring color selection.
- D. Installation: Submit manufacturer's installation instructions
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals. Include precautions against harmful cleaning materials and methods.

- B. Submit warranty documents specified herein.

1.6 REGULATORY REQUIREMENTS

- A. Requirements for Physically Disabled: Provide identifying devices meeting the 2010 ADA Standards for Accessible Design, and 2016 California Building Code (CBC) Title 24 Part 2; Chapter 11B, Division 7 - Communication Elements and Features, with ANSI 2012 Supplement, and sections as follows:

1. Signs, General: Section 11B-703.1.
2. Raised Characters: Section 11B-703.2.
 - a. Depth: Section 11B-703.2.1.
 - b. Case: Section 11B-703.2.2.
 - c. Style: Section 11B-703.2.3.
 - d. Character Proportions: Section 11B-703.2.4. Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase "I".
 - e. Character Height: Section 11B-703.2.5. Character height measured vertically from the baseline of the character shall be 5/8-inch minimum and 2 inches maximum, based on the height of the uppercase "T".
 - f. Stroke Thickness: Section 11B-703.2.6. Stroke thickness of the uppercase letter "T" shall be 15 percent maximum of the height of the character.
 - g. Character Spacing: Section 11B-703.2.7.
 - h. Line Spacing: Section 11B-703.2.8.
 - i. Format: Section 11B-703.2.9. Text shall be in a horizontal format.
3. Braille Symbols: Section 11B-703.3. and 11B-703.4. Braille shall be California Contracted Grade 2.
4. Installation Height and Location: Section 11B-703.4.
5. Visual Characters: Section 11B-703.5.
6. Pictograms: Section 11B-703.6.
7. Symbols of Accessibility: Section 11B-703.7.
 - a. Finish and Contrast: Section 11B-703.7.1.
 - b. Symbols: Section 11B-703.7.2.
 - 1) International Symbol of Accessibility: Section 11B-703.7.2.1.
 - 2) Assistive Listening Systems: Section 11B-703.7.2.4.
 - 3) Toilet Facilities Geometric Symbols: Section 11B-703.7.2.6.

- B. Braille Symbols: California Grade 2 braille shall be used wherever braille symbols are specifically required. Dots shall be 1/10-inch (2.5 mm) on center in the same cell with 3/10-inch space between cells measured between the second column of dots in the first cell to the first column of dots in the adjacent cell. Dots shall be domed or rounded profile, and raised a minimum of 1/40-inch above the background. Comply with CBC Table 11B-703.3.1 – Braille Dimensions.

- C. Inspection: Signs and identification devices shall be field inspected after installation and approved by the enforcing agency prior to the issuance of a final certificate of occupancy per 2016 CBC, Chapter 1, Division II, Section 111, or final approval where no certificate of occupancy is issued. The inspection shall include, but not be limited to, verification that Braille dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with these regulations. CBC Section 11B-703.1.1.2.

1.7 DELIVERY AND STORAGE

- A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

- B. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
- D. Handle products in accordance with manufacturer's instructions.

1.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace signage that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS – EXTERIOR PLAQUE SIGNS

- A. Sign finish shall comply with the following performance requirements:
 - 1. Weatherability: When tested in accordance with ASTM G 53, after 500 hours in a Weatherometer (equivalent to approximately 3 years exterior exposure):
 - a. Gloss retention not less than 88.0 determined in accordance with ASTM D 523 at a 60 degree angle.
 - b. Color shall not change more than 1.68 units determined in accordance with ASTM D 2244 and measured with a Hunter Colorimeter, Model D25.
 - 2. Durability: Sign finish shall show no effect after repeated use of cleaners such as Graffiti Remover #1120 manufactured by Fine Organics Corp., Lodi, NJ.

2.2 SIGNAGE SYSTEMS

- A. Acceptable manufacturers or equal:

ASI Signage Innovations; www.asisignage.com
 Accent Signage Systems; www.accentssignage.com
 Advance Corporation; www.advancecorp.com
 Ellis & Ellis Sign Systems; www.ellissigns.com
 Mohawk Sign Systems, Inc.®; www.mohawksign.com
 Weidner Architectural Signage; www.weidnerca.com
 Substitutions: Section 01 25 13 "Product Options and Substitutions."

- B. Interior Plaque Signs: Acceptable product or equal:

Basis-of-Design Product: ASI Signage Innovations; www.asisignage.com; Model: InForm Plaque Signs.

- 1. Sign Types: As shown on drawings.

- C. Exterior Plaque Signs: Acceptable product or equal:

Basis-of-Design Product: Advance Corporation, Braille-Tac™ Division; www.advancecorp.com; Model: Braille-Tac™ Chemcast™ (etched magnesium) sign systems.

1. Sign Types: As shown on drawings.

2.3 MATERIALS

A. Aluminum Alloy Products:

1. Sheet or Plate, ASTM B209, alloy selected to meet the structural requirements of the specific application. Surface finish shall be smooth, free of extrusion marks or imperfections.
2. Extrusions: ASTM B221, alloy 6063-T5, or other alloy of equivalent durability and strength properties. Extrusions shall have a wall thickness of not less than 0.125-inch except 0.093-inch when reinforcing bosses are provided.
3. Aluminum Castings: ASTM B26 or ASTM B108, alloy and temper recommended by aluminum producer or finisher for casting process used and for use and finish indicated.

B. Zinc and Magnesium Alloy Plates: Metal alloys specifically formulated for photo chemical etching.

C. Acrylic Sheet: ASTM D4802, Category A-1, finish 1. Acceptable products, or equal:

Atohaas North America, Inc.; Plexiglas G
Cyro Industries; Acrylite GP

D. Photosensitive Polymer Sheet: Polyamid resin material specifically formulated for photo chemical etching.

2.4 TEXT AND GRAPHICS APPLICATION METHODS

A. Silkscreened Graphics: Execute silkscreened images with photo screens prepared from original art. No handcut screens will be accepted. Original art shall be defined as artwork that is a first generation reproduction of the specified art. All edges and corners shall be clean cut. Rounded corners, cut or ragged edges, edge build-up, bleeding, or surface pinholes will not be accepted.

B. Die Cut Graphics: Ensure that all edges and corners of finished letterforms and graphics are true and clean. Do not use letterforms and graphics with rounded positive or negative corners, nicked, cut, or ragged edges.

C. Engraved Graphics: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.

D. Photetched Graphics: Photographically generate text, graphics, and braille and chemically etch the polymer or metal to produce 1/32-inch raised text, graphics, and braille.

2.5 SIGN MATERIALS – INTERIOR PLAQUE SIGNS

A. Sign Face: High impact Acrylic/PVC thermoplastic alloy, pressure molded using Unibond™ co-molding process.

- B. Tactile Graphics and Text: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque surface using manufacturer's co-molding process. Glued-on letters are unacceptable.
 - 1. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant CBC and ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
- C. Colors: High contrast semi-matte integral colors for graphics. All integral resins shall be U.V. stabilized resins utilizing automotive grade pigments.
- D. Standard Colors: As selected by Architect from manufacturer's standard colors.

2.6 SIGN MATERIALS – EXTERIOR PLAQUE SIGNS

- A. Braille-Tac™ one-piece construction sign system utilizing Chemcast™ chemical etch process to produce raised numbers and letters with corresponding dome shaped, California Grade II Braille (complying with Specification #800), and pictograms, on magnesium alloy sign, all complying with ADA and CABO/A117.1 requirement. All signage will provide 70% contrast between text and background.

2.7 INTERIOR DIRECTIONAL, INFORMATIONAL, AND SAFETY SIGNS

- A. Provide unframed plaque signs.
- B. Panels: Fabricate panels from 1/16-inch thick clear, matte finished, optically corrected, acrylic plastic sheet laminated to 1/8-inch opaque acrylic plastic sheet. Apply non-tactile text and graphics to the backside of the clear acrylic sheet using reverse silkscreen process prior to laminating to the opaque plastic sheet.
- C. Message: As indicated on the Drawings.
- D. Type Face: As indicated on the Drawings.
- E. Colors: Custom color(s) as selected by the Architect.

2.8 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Adhesives: Type recommended by the manufacturer of the material specified to be laminated or adhered. No adhesives that will fade, discolor or delaminate as a result of proximity to sunlight or heat there from shall be used. Adhesives shall not change the color or otherwise deteriorate the materials to which they are to be applied. The adhesives shall be of non-staining, nonyellowing quality.

- C. Use material in "Two-Face Tape" Paragraph below for small signs only; it is suitable for smooth, nonporous surfaces. Two-face tape is generally 3M brand's "VHB Heavy Duty Mounting Tape."
- D. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.9 FABRICATION, GENERAL

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

2.10 FABRICATION – INTERIOR PLAQUE SIGNS

- A. Panel Depth: 0.125" thickness for all plaques except Toilet Room Door Signs which shall have 0.250" thick components.
- B. Panel Appearance:
 - 1. Semi-matte clear with color showing through back.
 - 2. Color: As selected by Architect from manufacturer's standard selection.
- C. Surface Texture: Matte.
- D. Letter Style, Size, and Layout Position:
 - 1. Fonts: As shown on drawings.
 - 2. Size: As shown on drawings.
 - 3. Layout Position: As shown on drawings.
- E. Braille Style and Size and Layout Position: Grade 2 California Braille, raised (integral) and translucent same as face of sign.

- F. Text Schedule: As shown on Drawings.
- G. Sign Size: Refer to Sign Type Drawings.
- H. Plaque Edge Detail: Straight.
- I. Installation Method: MH, mounting holes for tamper proof mechanical fasteners and SA, silicone adhesive.
- J. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- K. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
- L. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
- M. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

2.11 FABRICATION – EXTERIOR PLAQUE SIGNS

- A. Panels: Fabricate panels from 1/8-inch thick photo sensitized magnesium or zinc alloy. Chemically etch the background to provide borders, text, graphics, and Braille that extend not less than 1/32-inch above the background.
- B. Message: As indicated on the Drawings and determined by the Architect before fabrication.
- C. Type Face:
 - 1. Letters: Upper case letters, font and height as shown on drawings.
 - 2. Numbers: Font and height as shown on drawings.
- D. Sign Finish: Factory applied baked-on-acrylic polyurethane enamel, UV inhibited.
- E. Colors: Sign shall consist of minimum of two colors (text color and 70% contrasting background color). Final colors as selected by Architect from manufacturer's standard colors.

2.12 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of Installation: Start of installation implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard, CBC 11B-307.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install product at heights to conform to 2010 ADA Standards for Accessible Design, and applicable local amendments and regulations.
- C. Mounting Methods: Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance. Do not install signs on doors or other surfaces until finishes on such surfaces have been applied.
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 - 5. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.
 - 6. Adhere signs to glass with adhesive or two-face tape.
- D. Install signs within the following tolerances and in accordance with manufacturer's recommendations:

1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.
 2. Exterior Signs: Within 1 inch vertically and horizontally of intended location.
- E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.4 SIGN SCHEDULE

- A. Schedule: Refer to signage schedule as shown on Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

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SECTION 10 21 13.19

SOLID-COLOR REINFORCED COMPOSITE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Floor-anchored, overhead-braced, solid color reinforced composite substrate toilet compartments.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 09 22 16 - Non-Structural Metal Framing: Coordination with blocking in walls to secure panels, wall posts, and stiles.
 - 2. Section 09 29 00 - Gypsum Board, coordination with blocking.
 - 3. Section 09 30 13 - Ceramic Tiling, coordination with layout and installation.
 - 4. Section 10 28 13 - Toilet Accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for materials, fabrication, finishes, fastenings, hardware, and installation details.
- B. Shop Drawings: Submit shop drawings indicating elevations of partitions, thickness of plastic, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, hardware, fittings, mountings and other related items and installation details.
- C. Samples: Submit full range of color and pattern samples. After color and pattern selection has been made, submit samples of each color and pattern for verification.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10 years experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 years experience installing similar products.
- C. Field Measurements: Secure field measurements before preparation of shop drawings and fabrication where possible, for proper and adequate fabrication and installation of the work.
- D. Coordination: Furnish inserts and anchorages that must be built into other construction for installation of toilet compartments.

- E. Regulatory Requirements: Provide toilet compartments meeting the requirements for the physically disabled of the 2016 California Building Code (CBC) Title 24 Part 2, and 2010 ADA Standards for Accessible Design.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials in the manufacturer's original protective packaging except that should packaging become wet, remove it immediately to avoid wet storage stains.
- B. Store materials in an enclosed shelter providing protection from damage and exposure to the elements.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 WARRANTY

- A. Submit manufacturer's extended warranty under the provisions of Section 01 78 36.
- B. Submit Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.
- C. Submit Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc.. www.bobrick.com; as represented by R.E. Edwards & Assoc 925-829-2942. Location of manufacturing shall be the United States.
- B. Substitutions: Section 01 213 – Product Options and Substitutions.

2.2 SOLID COLOR REINFORCED COMPOSITE (SCRC) SUBSTRATE (SierraSeries)

- A. Solid Color Reinforced Composite (SCRC) Partitions: Bobrick SierraSeries.
 - 1. Color(s): As selected by Architect from manufacturer's standard SierraSeries range.
- B. Toilet Partitions:
 - 1. Configuration: Floor-mounted, overhead-braced partitions; with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.
 - a. Basis-of-Design: Bobrick 1092.67 SierraSeries Toilet Partitions, vandal resistant.
 - 1) Design Type: Standard height.
 - a. Door/Panel Height: 58 inches.
 - b. Floor Clearance: 12 inches.

- 2) Hardware: Vandal resistant full-height stainless steel hardware.
- C. Materials: Solid color reinforced composite (SCRC) material for stiles, panels, doors, and screens with Bobrick GraffitiOff® coating, thermoset and integrally fused into homogenous piece; high density polyethylene (HDPE), high density polypropylene not acceptable.
1. Composition: Dyes, organic fibrous material, and polycarbonate/phenolic resins.
 2. Surface Treatment: Non-ghosting, graffiti resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure.
 3. Edges: Same color as the surface.
 4. Provide material not less than 3/4-inch thick, with edges eased and free from saw marks.
 - a) Color(s): As selected by Architect from manufacturer's standard colors.
- D. Performance Requirements:
1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
 2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
 3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
 4. Smoke Developed Index (ASTM E 84): Less than 450.
 5. Flame Spread Index (ASTM E 84): Less than 75.
 6. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
- E. Finished Thickness:
1. Stiles and Doors: 3/4 inch.
 2. Panels and Screens: 1/2 inch.
- F. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 7 gauge, 3/16 inches thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
 2. Stile Shoes: One-piece, 22 gauge, 18-8 S, Type 304 stainless steel, 4 inch height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch or 1 inch stile thickness and capable of being fastened (by clip) to stiles starting at wall line.
- G. Wall Posts: Pre-drilled for door hardware, 18-8 S, Type 304, 16 gauge stainless steel with satin finish; 1 inch x 1-1/2 inches x 58 inches high.
- H. Anchors: Expansion shields and threaded rods at floor connections as applicable.
- I. Hardware: Stainless steel. Chrome-plated "Zamak", aluminum, extruded plastic hardware not acceptable.
1. Compliance: Operating force of less than 5 lb.
 2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on in-swing doors.
 3. Materials: 18-8 S, Type 304, heavy-gauge stainless steel with satin finish.
 4. Doorstops: Prevents in-swinging doors from swinging out beyond stile; on out-swing doors, doorstop prevents door from swinging in beyond stile.
 5. Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners secured directly into core not acceptable.
 - a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb per insert.
 6. Coat Hooks: Combination hook and rubber-tipped bumper, sized to prevent door from hitting mounted accessories, projecting no more than 1-1/8 inch from face of door. Mount hook at 48-inches above finish floor.

7. Hardware Type: Institutional Hardware (.67).
- a. Latch and Keeper for Doors: 14 gauge sliding door latch, 11 gauge keeper; latch slides on a shock-resistant nylon track. Sliding latch shall require less than 5 pounds of force to operate. Twisting latch to operate will not be acceptable. Latch track shall be attached to the door by machine screws into factory-installed threaded brass inserts. Latch track shall be attached to the door by machine screws into factory-installed threaded brass inserts.
 - b. Hinges: 16 gauge stainless steel continuous piano hinge, self-closing. Continuous hinge shall be attached to the door and stile by theft-resistant, pin-in-head Torx stainless steel machine screw into factory installed threaded brass inserts. Fasteners secured directly to the core are not acceptable.
 - c. Slide-Bolt Latch: Surface mounted stainless steel latch unit mounted 40-inches above finished floor. Slide door latch shall be 14 gauge and shall slide on nylon track. Sliding latch shall require less than 5 pounds of force to operate. Twisting latch to operate will not be acceptable. Latch track shall be attached to door by machine screws into factory installed threaded brass inserts.
 - d. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors.
 - e. Door Pull: Manufacturer's standard "U" shaped for out-swinging doors and both sides of accessible compartment doors, mounted 40-inches above finished floor. Mount pull directly below the latch in accordance with CBC 11B-604.8.1.2.
 - f. Mounting Brackets: 18 gauge stainless steel and extend full height of panel.
 - 1) U-Channels: Secure panels to stiles.
 - 2) Angle Brackets: Secure stiles-to-walls and panels-to-walls.

2.3 FABRICATION

A. Panels and Doors:

- 1. Door Dimensions: Unless otherwise indicated, furnish 24-inch wide in-swinging doors for standard toilet compartments and 36-inch wide in-swinging doors for compartments equipped for use by physically disabled.
- 2. Aluminum edging strip to be fastened to the bottom edge of all doors and panels.

B. Pilasters:

- 1. Anchorage and Leveling Devices: Leveling device shall be 7 gauge, hot rolled steel bar, chromate-treated and zinc-plated, thru-bolted to base to solid color reinforced composite stile. Furnish 4-inch high pilaster shoes held in place by concealed clips.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before covering wall framing with finish materials, examine framing to ensure that backing plates have been installed behind wall mounting brackets in such position as to receive all attachment screws.

3.2 PREPARATION

- A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
 - 1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
 - 2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.3 INSTALLATION

- A. General: Install toilet compartments as shown on the shop drawings and in accordance with the manufacturer's specifications and printed installation instructions. Install toilet compartments and doors in a rigid and substantial manner, straight and plumb, with horizontal lines level.
- B. Pilasters: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead bracing to each pilaster with not less than two fasteners.
- C. Panels: Provide clearances of not more than 1/2 inch between pilasters and panels and 1 inch between panels and walls.
 - 1. Secure panels and screens to walls with continuous brackets.
 - 2. At light gage steel framed walls fasten brackets with toggle or molly bolts into metal studs or backing plates fastened directly to the studs.

3.4 ADJUSTING AND CLEANING

- A. Hardware Adjustment: After installation, carefully adjust hardware for proper operation. Except for accessible stalls, set hinges on in-swinging doors to hold open approximately 30 degrees from the closed position when unlatched. Set hinges on out swinging doors to return to the fully closed position. Adjust doors so that bottoms of doors are level with the bottoms of the pilasters when the doors are in the closed position. Accessible stall doors shall be self-closing.
- B. Cleaning: Clean compartments and doors upon completion of work and leave free from imperfections.

END OF SECTION

08/27/18

SECTION 10 22 39

FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Folding panel partitions hinged in pairs for manual operation.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Work:
 - 1. Section 03 30 00 - Cast-in-Place Concrete, for concrete tolerances required.
 - 2. Section 05 50 00 - Metal Fabrications; for primary structural support, including pre-punching of support members by steel supplier in accordance with template supplied by operable partition supplier's template.
 - 3. Section 06 10 53 - Miscellaneous Rough Carpentry: Wood framing and supports, and blocking at head and jambs as required.
 - 4. Section 09 22 16 - Non-Structural Metal Framing: Wall and ceiling framing at head and jambs.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions on physical characteristics, durability, resistance to fading, and flame spread characteristics for each type of folding panel partition and installation accessory required.
- B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- C. Samples: Submit manufacturer's standard color charts showing full range of colors and materials for each component exposed to view, available for each type of folding panel partition. After selection, submit 6" by 6" samples of each panel facing material.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- B. Product Certificates: Submit certifications by an independent testing laboratory for STC Rating and Flame Spread Classification.
- C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
 - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, track switches, carriers, and other operating components.
- B. Deliver special panel operating tools to Owner.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Preparation of Opening: Conform to ASTM E557 – Standard Practice for Architectural Application and Installation of Operable Partitions.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire performance characteristics, and lot number.
- B. Store panels only on edge, blocked off ground to prevent sagging and warping, in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Faulty operation of operable panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period: 2 years from date of Substantial Completion.
3. Warranty Period for Floor Supported Suspension System: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E90, determined by ASTM E413, and rated for not less than the STC indicated.
- B. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by a testing and inspecting agency acceptable to State Fire Marshal:
 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Flame-Spread Index: 25 or less.
Smoke-Developed Index: 50 or less.

2.2 MANUFACTURERS

- A. Acceptable manufacturers or equal:

Modernfold, Inc.
Advanced Equipment Corporation
Hufcor, Inc.
Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Partitions listed herein are for descriptive purposes and to establish a standard of quality. Partition is based on Modernfold, Inc.; Acousti-Seal #932FS manually operated, floor-supported, paired-panel, operable partition.

2.3 OPERATION

- A. Acousti-Seal #932FS: Series of paired flat panels hinged together in pairs, manually operated, floor supported with no mechanical floor seals
- B. Final Closure:
 1. Hinged panel closure.

2.4 PANEL CONSTRUCTION

- A. Nominal 3-inch thick panels in manufacturer's standard 48-inch widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
1. Panel Skin: 1/2 inch NAUF medium density fiberboard, single material or composite layers continuously bonded to panel frame. Acoustical rating of panels with this construction: 50 STC.
 2. Acoustical Performance: Provide folding panel partition assembly tested by independent testing laboratory acceptable to the Owner, in a full-scale opening (14 feet by 9 feet) for laboratory sound transmission loss performance in accordance with ASTM E90, determined by ASTM E413 and rated for STC of 50 plus or minus 1.
 3. Hinges for Panels and Closure Panels: Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
 4. Panel Trim: No vertical trim permitted on vertical edges of panels; minimal groove appearance at panel joints.
 5. Panel Weight: As standard with manufacturer for STC selected, 6.5 to 8 pounds per square foot.
- B. Panel Finish and Exposed Trim: Factory applied, Class A rated material and as follows:
1. Panel Finish: Tack board, minimum 1/4 inch corkboard covered with vinyl coated fabric.
 2. Vinyl Coated Fabric: Provide integrally pigmented, opaque virgin vinyl calendared film vinyl wall covering material treated with mildew and antimicrobial additives and laminated to backing. Meet the requirements of ASTM F793 for Category II, medium duty; total weight 27-ounces per square yard minimum; vinyl coating 7-ounces per square yard minimum over osnaburg backing material.
 - a. Stain Resistance: Provide material with delustered clear polyvinyl fluoride film not less than 0.0005-inch (1/2-mil) thick as top coating meeting the requirements of ASTM F793 (DuPont "Tedlar"). Do not include weight of stain resistant coating as part of required vinyl coating weight or total fabric weight.
 - b. Color, Pattern and Texture: As selected by Architect from manufacturer's standard selection.
 3. Exposed Panel Trim Color: One consistent color, as selected by the Architect from manufacturer's standard colors.

2.5 SOUND SEALS AND BOTTOM SEALS

- A. Vertical Interlocking Sound Seals Between Panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.
- B. Horizontal Top and Bottom Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

2.6 SUSPENSION SYSTEM AND SOFFITS

- A. Equal to Modernfold #17 Floor Supported Suspension System.
 - 1. Floor Track: Minimum 16-gage stainless steel shall support nominally 80% or more of the panel weight. Surface mounted application shall require no alteration of the floor surface. Recessed floor track shall require a kerf no wider than 1-inch nor deeper than 1-inch.
 - 2. Suspension Tracks: Minimum 11-gage, 0.12-inch roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 3/8-inch diameter threaded rods. Aluminum track is not acceptable.
 - a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 - 3. Carriers: One all-steel trolley with steel-tired ball bearing wheels per panel (except hinged panels).
- B. Non-steel tires are not acceptable.

2.7 WORK SURFACES

- A. Work Surfaces: Quantities, placement, and size indicated.
 - 1. Surface: Markerboard, white enamel on steel, bonded to the face of the panel with horizontal trim without exposed fasteners. Trim is not acceptable on vertical edges to provide uninterrupted work surface.
 - 2. Size:
 - a. Folding Panel Partition Type K: Full width and height of panel, both sides of panel.
 - b. Folding Panel Partition Type L: Full width of panel by 48 inches in height where shown, both sides of panel.
- B. Eraser Pocket: Aluminum with mill or clear anodic finish, both sides of Folding Panel Partition Type L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting, have been completed.

- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.

3.3 ADJUSTING

- A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION

09/21/18

SECTION 10 26 13

CORNER GUARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Stainless steel corner guards.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 SUBMITTALS

- A. Product Data: Submit product data showing list of materials and hardware, sizes, and installation methods for each type of substrate.
- B. Shop Drawings: Submit shop drawings showing locations, extent, and installation details of corner guards. Show methods of attachment to adjoining construction.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide corner guard system components that are identical to those tested in accordance with ASTM E84 for the fire performance characteristics specified. Identify components with appropriate markings from a testing and inspection organization acceptable to the State Fire Marshal.

Flame Spread: 25 or less.

Smoke Developed: 450 or less.

- B. Single Source Responsibility: Obtain each color, grade, finish and type of wall and corner guard system component from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Design Criteria: The drawings indicate the size, profile and dimensional requirements of wall and corner guard system components required and are based on the specific types and models specified. Wall and corner guard system components by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.
- B. Store materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, and soiling.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: AISI Type 304, stainless steel plate, minimum 16 gage, No. 4 satin finish.
- B. Fasteners: Provide nonmagnetic stainless steel screws, bolts, and other fasteners compatible with hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

2.2 CORNER GUARDS

- A. Stainless Steel Corner Guards: Manufacturer's standard paper-covered satin finish, 16 gage minimum, stainless steel corner guards, height as indicated, with 3-1/2" by 3-1/2" wings. Provide 90 degree turn, mounting holes 8 inches on center, formed edges. Mount with stainless steel countersunk screws. Acceptable products or equal:

American Floor Products Co., Inc.; www.afco-usa.com; Lunar Style L-1 right angle.

Pawling Corporation; www.pawling.com; Type CG Series.

Wilkinson Company, Inc.; WCG Series.

Substitutions: Section 01 25 13 – Product Options and Substitutions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions in which corner guards will be installed. Complete all finishing operations, including painting, before beginning installation of corner guards.

3.2 INSTALLATION

- A. Install units plumb, level, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.

3.3 CLEANING

- A. Immediately upon completion of installation, clean metal components in accordance with the manufacturer's recommendations.
- B. Remove paper protection from stainless steel corner guards and clean in accordance with the manufacturer's recommendations.

END OF SECTION

08/27/18

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Warm-air dryers.
 - 3. Underlavatory guards.
 - 4. Custodial accessories.
- B. Products Installed But Not Furnished or Supplied Under This Section:
 - 1. Toilet tissue dispensers and Paper towel dispensers are Owner-Furnished, Contractor Installed.
- C. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- D. Related Sections:
 - 1. Section 26 05 13 - Conductors and Cables: Electrical supply, conduit, wiring, boxes, and wiring devices for hand dryers.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)
General Services Administration Federal Specifications (Fed. Spec.)

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for project.
 - 5. Include electrical characteristics.

- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Regulatory Requirements: Provide toilet accessories meeting the requirements for the physically disabled of the 2016 California Building Code (CBC), and 2010 ADA Standards for Accessible Design.
- C. Products: All products (other than warm-air dryers) shall be supplied by a single manufacturer. All toilet room accessories shall be keyed alike using manufacturers standard key to avoid Owner's maintenance department from having to handle multiple manufacturers keys, for ease of replenishing and maintenance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver toilet accessories to the site in unopened containers labeled with the manufacturer's name and model numbers as they occur on the submittals. Store accessories in their containers in a dry location.

1.9 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's standard warranty period for Electric Hand Dryers: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished, Contractor Installed Products:

1. Toilet tissue dispensers.
2. Paper towel dispensers.

2.2 PERFORMANCE REQUIREMENTS

- ### A. Electrical Components, Devices, and Accessories:
- Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 MATERIALS

- ### A. Stainless Steel:
- ASTM A666, Type 304, with No. 4 finish (satin), minimum nominal thickness of 0.0312-inch unless otherwise specified.
- ### B. Steel Sheet:
- ASTM A1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- ### C. Galvanized Steel Sheet:
- ASTM A653, with G60 hot-dip galvanized coating.
- ### D. Galvanized-Steel Mounting Devices:
- ASTM A153, hot-dip galvanized after fabrication.
- ### E. Chrome Plating:
- ASTM B456, Service Condition Number SC 2 (moderate service), nickel plus chromium electro-deposited on base metal.
- ### F. Mirror Glass:
- Mirror quality plate or float glass in accordance with ASTM C1036 with silver coating, copper protective coating and nonmetallic paint coating complying with Fed. Spec. DD-M-411B.
- ### G. Fasteners:
- Stainless steel except fully concealed fasteners may be galvanized steel.

2.4 PUBLIC-USE WASHROOM ACCESSORIES SCHEDULE

- ### A. Manufacturer:
- Bobrick Washroom Equipment Company.

- ### B. Stainless Steel, Welded, Angle Frame Mirrors:
- Drawing Designation: EQ-09.

1. Basis of Design: Bobrick Model B-290 1836.
 - a. Overall Size: 24 inches W x 36 inches H.
2. Angle Frame:
 - a. Materials: Type 304 stainless steel angle 3/4 inch x 3/4 inch, with satin finish with vertical grain on exposed surfaces.
 - b. Construction: One-piece, roll-formed construction with continuous integral stiffener.
 - c. Design: Beveled design on front of angle to hold mirror tightly against frame; prevents exposure to sharp edges.
 - d. Corners: Heliarc welded, ground, and polished smooth.
3. Mirror:
 - a. No. 1 quality, 1/4 inch (6mm) float/plate glass.
 - b. Edges: Protected with plastic filler strips.
 - c. Back of Mirror: Protected by full-size, shock-absorbing, water-resistant, non-abrasive 3/16 inch (5mm) thick polyethylene padding.

4. Mounting: Removable, galvanized steel back with integral horizontal hanging brackets located at top and bottom for mounting on Concealed one-piece rectangular wall hanger(s); galvanized steel back fastened to frame with Concealed screws to permit glass replacement; attachment by rivets or tabs is not acceptable; Concealed Phillips head locking setscrews secure mirror to wall hanger in bottom of frame.

2.5 GRAB BARS

A. Stainless Steel Grab Bars: With snap flange covers: Drawing Designation: EQ-04 and EQ-05.

1. Satin Finish with Peened Grip:
 - a. Basis of Design: Bobrick Model B-6806.99X36.
 - 1) Length: 36 inches.
 - b. Basis of Design: Bobrick Model B-6806.99X42.
 - 1) Length: 42 inches.
2. Compliance: Accessibility guidelines (including ADAAG) for structural strength.
 - a. Capacity: Designed to support 900 lbs. in compliant installations.
3. Description: Clearance between grab bar and finished wall is 1-1/2 inches.
4. Grab Bar Materials: 18-8, Type 304, stainless steel tubing with satin finish.
5. Grab Bar Construction: 18 gauge (1.2 mm), ends heliarc welded to flanges.
6. Outside Diameter: 1-1/2 inch (38 mm).
7. Mounting Flanges: Concealed, 18-8, Type 304, 1/8 inch thick, stainless steel plate.
 - a. End Flanges: 2 inches x 3-1/8 inches with two holes for attachment to wall.
 - b. Intermediate Flanges: 2-5/8 inches x 3-1/8 inches wide x 3-1/8 inch diameter.
8. Snap Flange Covers: 18-8, Type 304, 22 gauge drawn stainless steel with satin finish, 3-1/4 inch diameter x 1/2 inches deep; snap over mounting flange to conceal mounting screws.
9. Mounting Accessories: Provide the following optional mounting accessories as scheduled and indicated on the Drawings and as required for complete installation.
 - a. Mounting Kits: Provide optional Bobrick Part No. 252-30 Mounting Kit; Three Type 304 stainless steel, Phillips round-head, sheet-metal screws for each flange.
 - b. Anchor Devices: Provide optional Bobrick Part No. 2583 Optional Mounting Kit; for 3/4 inch to 1 inch panels.
 - c. Anchor Devices: Provide optional Bobrick Part No. 2586 Optional Mounting Kit; for 1/2 inch panels.

B. Surface-Mounted Toilet Seat Cover Dispensers: Drawing Designation: [].

1. Basis of Design: Bobrick ClassicSeries Model B-221.
2. Materials: 18-8 Type 304 stainless steel with satin finish.
3. Construction: All-welded, 22 gauge; with beveled opening.
4. Filling: Concealed opening in bottom for filling.
5. Dispensing: Single- or half-fold paper toilet seat covers.
6. Capacity: 500 paper toilet seat covers.

C. Surface-Mounted Vertical Soap Dispensers: Drawing Designation: [].

1. Basis of Design: Bobrick Classic Model B-2111.
2. Compliance: Valve is operable with one hand, without tight grasping, pinching or twisting of the wrist and with less than 5 pounds of force (22.2 N) to comply with barrier-free accessibility guidelines (including ADAAG).
3. Container:
 - a. Materials: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
 - b. Construction: Body is drawn, one-piece, seamless construction.
4. Valve: Corrosion-resistant, black molded plastic push button and spout, antibacterial-soap-resistant plastic cylinder; soap head-holding mushroom valve, stainless steel spring, U-packing seal and duckbill.

5. Mounting: Vandal-resistant, concealed wall plate; back plate with mounting bracket.
6. Filling: Locked, hinged stainless steel lid for top filling opens with key provided. To prevent corrosion of tank, use only chloride-free pH-neutral liquid soaps.
7. Refill Indication: Clear acrylic refill-indicator window.
8. Capacity: 40 fl oz.

C. Surface-Mounted Sanitary Napkin Disposal Units: Drawing Designation [].

1. Basis of Design: Bobrick ConturaSeries Model B-270.
2. Container: All-welded, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish on exposed surfaces. Front of container shall have same degree of arc, radius on corners and edges as other Bobrick ConturaSeries washroom accessories.
3. Cover: Drawn, one-piece, seamless, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish. construction. Front of cover has same degree of arc, radius on corners and edges as other Bobrick ConturaSeries washroom accessories.
4. Hinge: Full-length stainless steel piano-hinge.

E. Recessed Waste Receptacles: For 4 inch walls: Drawing Designation: []

1. Basis of Design: Bobrick ClassicSeries Model B-3644.
 - a. Capacity: 12 gallons.
2. Cabinet: All-welded, 18-8, Type 304, heavy gauge stainless steel with satin finish on exposed surfaces.
3. Flange: Drawn and beveled, one-piece, seamless, 18-8, Type 304, 22 gauge stainless steel with satin finish.
4. Waste Receptacle: 18-8, Type 304, 22 gauge stainless steel with satin finish, hemmed top edges and front and side edges of bottom and top edges; secured to cabinet with a tumbler lock keyed like other washroom accessories. Equipped with interior hooks for optional vinyl liner.

F. Robe Hooks: Drawing Designation: EQ-08.

1. Basis of Design: Bobrick Classic Model B-6717.
 - a. Finish: Satin.
 - b. Configuration: Single hook.
2. Projection from Wall: 2 inch.
3. Flange and Support Arm: All-welded, 18-8, Type 304, 22 gauge stainless steel.
4. Mounting: Concealed bracket, 18-8, Type 304, 16 gauge stainless steel; secured to wall plate with a stainless steel setscrew.
5. Wall Plates: Concealed, 18-8, Type 304, 16 gauge stainless steel.
6. Caps: 18-8, Type 304, 10 gauge stainless steel; welded to support arm.

2.6 WARM AIR DRYERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products from Excel Dryer Corporation, www.exceldryer.com.

B. High-Speed Warm-Air Dryer:

1. High Efficiency Heated Air Hand Dryer: XLERATOR, EPD Certified, Rapid-drying, energy efficient, rapid drying, automatic sensor, adjustable speed and sound control, adjustable heat control, electric hand dryer; surface mounted or semi-recessed; entire dryer internally grounded. Made in the USA Certified.
2. Basis-of-Design Product: Model XLERATOR XL-W.
3. Description: High-speed, warm-air hand dryer for rapid hand drying.
4. Mounting: Recessed. ADA compliant recess kit is fabricated of 22 GA 18-8 type 304 stainless steel with #4 satin finish with 16 GA 18-8 type 304 stainless steel dryer

- mounting plate. All welded construction. 16-3/8 inches wide by 26 inches high by 3-3/8 inches deep.
5. Controls: Automatic, activated by infrared optical sensor located next to the air outlet. Dryer will operate as long as hands are under the air outlet and has a 35-second lockout feature if hands are not removed. Control includes adjustable sound and speed control mechanism, adjustable heat control with High, Medium, Low and Off settings and a filter sensor which is activated should the filter become clogged. Sensor equipped with externally visible Red LED light that flashes error codes to assist in troubleshooting. Control assembly sealed for protection against moisture, lint, dust and vandalism.
 6. Cover Material and Finish:
 - a. Material: Zinc die cast.
 - b. Finish: White, painted.
 6. Air Intake: Inlet openings on bottom of cover.
 7. Air Outlet: Delivers focused air stream of 19,000 LFM at nozzle and 16,000 LFM at average hand position of 4 inches below air outlet.
 - a. Provide Noise Reduction Nozzle: Reduces air deflection noise level by 9 dB and increases the dry time by 2-3 seconds.
 8. Pre Filter: Extends the lifespan and improves reliability. Reduces lint, dust and other airborne debris from entering the internal motor chamber. Filter sensor is activated if filter becomes clogged.
 9. Nominal Size: 11-3/4 inches wide by 12-11/16 inches high by 6-11/16 inches deep.
 10. Weight:
 - a. 17 pounds die cast cover.
 11. Power Source:
 - a. 110 - 120 Volts, 11.3 - 12.2 Amps, 50/60 Hz, 1240 - 1450 Watts.
 12. Combination Motor and Blower: Series commutated, through-flow discharge, vacuum type; 5/8 HP, 20,000 RPM. Airflow rate: 19,000 linear feet per minute at air outlet, 16,000 linear feet per minute at average hand position of 4 inches below air outlet.
 13. Heater: Nichrome wire element, mounted inside blower housing to be vandal resistant. Heater Safeguard: Automatic resetting thermostat to open when airflow is restricted and close when airflow is resumed.
 14. Air Temperature: 135 degrees F measured at average hand position of 4 inches below air outlet. Air Heater Output: 970 watts.
 15. All metal parts coated according to Underwriters Laboratories, Inc. requirements.

2.7 UNDERLAVATORY GUARDS

- A. Underlavatory Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings. Acceptable products or equal:

Brocar Products, Inc.; Trap Wrap
Truebro, Inc.; Lav-Shield

2.8 CUSTODIAL ACCESSORIES

- A. Mop and Broom Holders:
 1. Basis of Design: Bobrick Model B-223 x 24.
 - a. Length: 24 inches with 3 mop/broom holders.
 2. Mounting Base: 18-8, Type 304, 22 gauge stainless steel with satin finish.
 3. Mop and Broom Holders: Replaceable, spring-loaded rubber cams with anti-slip coating; accommodates handles from 7/8 inch to 1-1/4 inch in diameter; with powder coated steel retainers.

2.9 FABRICATION

- A. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- B. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless steel hinge. Provide anchorage that is fully concealed when unit is closed.
- C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034-inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- D. Mirror-Unit Hangers: Provide one of the following mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 6 keys to Owner as specified in Section 01 78 23.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before covering wall framing with gypsum board, examine framing to ensure that backing plates and grab bar mounting kits have been installed behind surface mounted accessories in such positions as to receive all attachment screws.
- B. Verify that pipes, vents, conduits and other construction features do not protrude into rough wall opening space required for recessed accessories.
- C. Do not proceed with the work until unsatisfactory conditions have been resolved.

3.2 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - 1. Verify blocking has been installed properly.
 - 2. Verify location does not interfere with door swings or use of fixtures.
 - 3. Comply with manufacturer's recommendations for backing and proper support.
 - 4. Use fasteners and anchors suitable for substrate and project conditions.
 - 5. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
 - 6. Conceal evidence of drilling, cutting, and fitting to room finish.
 - 7. Test for proper operation.

- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.
- C. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square.

3.3 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

09/21/18

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fire extinguishers and fire extinguisher cabinets.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

ASTM International (ASTM)

National Association of Architectural Metal Manufacturer's (NAAMM)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Cabinets: Materials description for fire extinguisher cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.
 - 2. Extinguishers: Materials description for fire extinguishers; include ratings and classifications.
 - 3. Installation instructions for each product specified.
- B. Shop Drawings:
 - 1. Small-scale plans showing locations of fire extinguisher cabinets and individual fire extinguishers.
 - 2. Product Schedules showing each type of cabinet and extinguisher to ensure proper fit and function.
 - 3. Indicate installation procedures and accessories required for a complete installation.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.5 REGULATORY REQUIREMENTS

- A. Fire extinguishers shall be labeled by Underwriters' Laboratories, Inc (UL) for the specified ratings and classifications, as acceptable to the State Fire Marshal.

- B. Fire extinguisher cabinet doors to open with 5 pounds maximum force.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver extinguishers and cabinets to the site in unopened containers, labeled plainly with the manufacturer's names and brands. Deliver cabinets and extinguisher to the site ready for installation.
- B. Store cabinets and extinguisher in safe, dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE EXTINGUISHERS

- A. Multi-Purpose Dry Chemical Type: UL rated 2A-10B:C; and 3A-40B:C (Food Service) in nominal 5 pound capacity.
 - 1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright squeeze grip.
 - 2. Finish: Factory powder-coated; Red.
 - 3. Effectiveness (Rating): Class A, B, and C fires.
 - 4. Acceptable products or equal:

J. L. Industries, Inc., a division of Activar Construction Products Group;
www.activarcpg.com; Cosmic 5E.
Larsen's Manufacturing Co.; Model No. MP5.
Potter-Roemer Div.; No. 3005.

2.3 FIRE EXTINGUISHER CABINETS

- A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated or specified.
- B. Acceptable products or equal:

JL Industries; Cosmopolitan Series. (Basis-of-Design product).
Larsen's Manufacturing Co.; (SS).
Potter-Roemer Div.; Alta (stainless).
- C. Cabinet with Stainless Steel Trim and Door: Cosmopolitan Series.
 - 1. Cabinet Style: Semi-recessed.

2. Components:
 - a. Tub (Semi-recessed Cabinets): Cold-rolled steel.
 - 1) Finish: Factory-applied powder coat paint finish.
 - a) Standard Color: White.
 - b. Door and Trim Construction: Stainless steel; flush doors with 5/8 inch door stop attached by continuous hinge and equipped with black ABS recessed pull with roller catch.
 - 1) Finish: Factory-applied ground and polished finish.
 - a) Standard Finish: #4 directional satin finish.
 - c. Trim Style and Depth:
 - 1) Semi-Recessed Cabinet:
 - b) Rolled Edge: 2-1/2 inch.
 - 2) Trim Dimensions: 1-3/4 inch face trim on frame and 1-1/4 inch face trim on door.
3. Fire-Rating: Nonfire-rated; and Fire-Rated for 1-hour combustible and noncombustible wall systems.

2.4 CABINET DOOR STYLE

- A. Door Style: Style V: Vertical Duo Panel; narrow vertical glazing full height of door; with ADAC Flush Pull Handle. Plastic recessed cup-type handle.
- B. Door Glazing: Clear tempered glass.

2.5 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguishers to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish (red or black in color).
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

J. L. Industries, Inc., a division of Activar Construction Products Group;
www.activarcp.com;
Larsen's Manufacturing Co.
Potter-Roemer Div.

2.6 FABRICATION

- A. Fire-Extinguisher Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Fabricate door frames of one-piece construction with edges flanged.

3. Miter and weld perimeter door frames.

- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 SOURCE QUALITY CONTROL

- A. Ship extinguishers to the Project site fully charged, EXCEPT those which contain water as an extinguishing agent, if any.
- B. Obtain Fire Extinguishers and Fire Extinguisher Brackets from same manufacturer to ensure compatibility.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses in walls for semi-recessed fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

3.3 INSTALLATION

- A. Mount items specified herein in locations indicated and at mounting height of +48-inches to fire extinguisher handle above finished floor, or at heights to comply with applicable regulations of State Fire Marshal. Coordinate the cabinet manufacturer's mounting details with other trades as their work progresses.
- B. Securely fasten fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions. Use oval head fasteners with exposed surfaces of same finish as cabinet. Fasten cabinets to wood studs with full threaded wood screws or with sheet metal screws.

- C. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.
- D. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- E. Wall Signs:
 - 1. Location: Where shown or directed.
 - 2. Apply on walls after field painting is completed and has been accepted.

3.4 FIELD QUALITY CONTROL

- A. Ensure that each extinguisher is fully charged, and that inspection of each extinguisher has been performed, as evidenced by the National Association of Fire Equipment Distributors certification tag, just prior to turnover.

3.5 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-extinguisher cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-extinguisher cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-extinguisher cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-extinguisher cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-extinguisher cabinet and mounting bracket manufacturers.
- E. Replace fire-extinguisher cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

08/27/18

SECTION 10 71 13

EXTERIOR SUN CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide fixed Custom Sunshades as shown on the drawings, as specified, and as needed for a complete and proper installation.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 50 00 - Metal Fabrications.
 - 2. Section 08 43 13 - Aluminum-Framed Storefronts.
 - 3. Section 08 44 13 - Glazed Aluminum Curtain Walls.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

National Association of Architectural Metal Manufacturers (NAAMM)
American Architectural Manufacturers Association (AAMA)

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum exterior sunshades. Include plans, elevations, sections, blade angles, blade spacing and attachments to compatible systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.4 DIVISION OF STATE ARCHITECT DEFERRED APPROVAL

- A. Deferred approval required for exterior sun control devices.
- B. After Architect has reviewed the shop drawings and materials prepared and provided by Contractor for the Deferred Approval item, Architect will forward those materials to Division of the State Architect (DSA) for their review and comment.
- C. Contractor shall make all DSA required corrections, shall provide all DSA required documentation, and shall coordinate and resubmit those materials to Architect for forwarding to DSA.

- D. If a second round of corrections and resubmittals is required by DSA, Contractor shall be responsible for all time and coordination with DSA, without further involvement by Architect, or Contractor shall compensate Architect for their time if Contractor chooses to continue to involve Architect in the process with DSA.
- E. When Contractor has obtained DSA approval of the Deferred Approval materials, Contractor shall resubmit a copy of those same DSA approved materials to Architect for Record.
- F. No work shall commence on a Deferred Approval item until all these requirements have been completed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating exterior sunshades, and storefront systems that meet or exceed performance requirements.
- C. Manufacturer must operate, design, assemble, and finish their product in the United States of America as a "Made in America" product. All materials must be procured from sources inside the United States of America.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for sunshades by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Arcadia, Inc., www.arcadiainc.com
 - 2. Construction Specialties, Inc.; www.c-sgroup.com
 - 3. MM Systems Corp; www.mmsystemscorp.com
 - 4. Kawneer Company, Inc.; www.kawneer.com
- B. Basis-of-Design Product for Horizontal Sun Shades: Arcadia, Inc.; Brise Soleil Standard Series.

2.2 MATERIALS

- A. Aluminum Extrusion Blades: ASTM B211, Alloy 6063-T6.
- B. Aluminum Plate ASTM B211, Alloy 6061-T6.
- C. Fasteners: Fasteners shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions.
- D. Anchors and Inserts: Use non-Ferrous metal or hot dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or zinc galvanized expansion bolt devices for drill-in place anchors. Furnish inserts, as required, to be set into concrete or masonry work. Field weld clips.

2.3 FABRICATION, GENERAL

- A. Provide fixed Sunshades and accessories of design, material, sizes, depth, arrangement, and thickness as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
- B. Include supports, anchorage, and accessories required for complete assembly, including all attachment clips and necessary hardware for attachment to structure.
- C. Manufacturer shall allow $\pm 1/8"$ thermal expansion room at each shade to compensate for dissimilar movement between building structure and aluminum sunshade structure. This design shall be incorporated as to not induce self destructing loads onto either shade or building veneer.
- D. No blade fasteners shall be visible after installation of sections. Provide cover plates at each outrigger end to conceal fasteners. Only mounting hardware shall be visible after installation.

2.4 SUNSHADE CONSTRUCTION

- A. Components:
 - 1. All fascia and blades shall be 6063-T6 aluminum-extruded members.
 - a. Blade infill shall be custom designed with integral screw boss that is hidden from view visible after installation. Size and spacing is to be as shown on the architectural details. Blade infill shall be airfoils, rectangle or tubular sections.
 - b. Blades to be miter cut and fitted to outrigger plates at mitered corner conditions.
 - 2. Outrigger components shall be 6061-T6 aluminum plates.
 - a. Outriggers shall be shaped aluminum flat plates, screwed to aluminum extrusion blades via countersunk fastener holes. Connections of aluminum extrusions to outriggers should be flush with no protruding fasteners visible after installation. Outriggers are pre-drilled for mounting to the structural sunshade clip tab via stainless steel expansion slip connection to compensate for thermal expansion.
 - 3. Clip brackets shall be of carbon steel.
 - a. Connection of sunshade to building shall be friction type with the ability to properly level the shade during installation.
 - 4. Outrigger cover plates shall be furnished of 6061-T6 aluminum plates at each end of sunshade run to cover extrusion fasteners.

- B. Assembly: Components to be shop assembled in large practical sections to allow for immediate installation. Sections indicated on shop drawings to be assembled and shipped as units with cover plates and support arms, if required, shipped loose.
 - 1. Fasteners shall be bagged in groups clearly identifying bolt locations and bag contents for easy installation. Manufacturer to provide anti-seize compound for any field bolted stainless hardware to facilitate proper erection.
- C. Horizontal Sun Shades:
 - 1. Outrigger: Straight Square, dimensions as shown on drawings.
 - 2. Blade Type: Flat Bar, dimensions as shown on drawings..
 - 3. Fascia: Closed Rectangular Tube; dimensions as shown on drawings.

2.5 ALUMINUM FINISH FOR SHADES

- A. Finish all exposed areas of aluminum and components as indicated.
 - 1. An Architectural Class II or I anodic coating conforming with AA-M12C22A31/AA-M12C22A41.
 - a. Anodize finish color shall be Colornodic #11 Clear, to match finish of aluminum storefront and aluminum curtain walls.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine crates and reconcile to a shipping manifest or packing slip. Verify all required components are present.

3.2 FIELD DIMENSIONS / SITE INSPECTION

- A. Prior to Clip Installation:
 - 1. Verify conditions: Examine areas where work is to be performed and identify any conditions that could be detrimental to proper or timely completion.
- B. Prior to Shade Installation:
 - 1. Field confirm openings widths and elevations as shown on shop drawings prior to fabrication of shade sections. Field dimensions of clip locations shall be verified prior to fabrication of sections.
- C. Installation of sections should not proceed until all conditions are satisfactory.

3.3 INSTALLATION / ERECTION

- A. Comply with manufacturer's instructions and recommendations for installation of the work.
- B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.
- C. Anchor Sunscreen to building substructure as indicated on the sunshade shop drawings and verified by the Engineer of Record.
- D. Erection Tolerances:
 - 1. Clips or Mounting Brackets:

- a. Elevation clip Variation from level: 1/8" maximum in any column to column space or 20'-0" runs, non-cumulative.
- b. Offsets in projection of clips front leading edge 1/16"±.
- c. Veneer or Wall construction tolerance around clip projection. 1/4"+ outward.
- d. Clip Plumbness: 1/16" in 6"
- e. Clip projection level: 1/16" in 12"
- 2. Shade Sections:
 - a. Projection Level: 1/8" in 4'-0"
 - b. Horizontal Level: 1/8" max in any column to column space or in 20'-0" runs, non-cumulative.
 - c. Shade section to section variation 1/32" at adjoining sections.
- E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- F. Set units level, plumb and true to line, with uniform joints.
- G. Erect sunshade sections afviter all adjacent painting, masonry (including chemical treatments), roofing, electrical, glazing, and other similar work is completed above and below the shade sections.

END OF SECTION

09/21/18

SECTION 11 31 00

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing and installing of residential appliances as indicated and specified.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
Underwriters Laboratories (UL)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Product Schedule: Submit a schedule of appliances, using same room designations indicated.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of appliance.
- B. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Certification Labels: Provide equipment that complies with UL standards and labels.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.
- B. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

1.8 WARRANTY

- A. Refrigerator/Freezer, Sealed System: Limited warranty, including parts and labor for entire appliance.
 - 1. Warranty Period: 1 year from date of Substantial Completion.
- B. Microwave Oven: Limited warranty, including parts and labor for entire appliance.
 - 1. Warranty Period: One years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the 2016 CBC and 2010 ADA Standards

2.2 REFRIGERATOR

- A. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1. Basis-of-Design product or equal:

General Electric, Model GFE26GSKSS – Stainless Steel.

- 1. Type: Freestanding.
- 2. Dimensions:
 - a. Width: 35-3/4 inches.
 - b. Depth: 36-1/4 inches.
 - c. Height: 69-7/8 inches.
- 3. Storage Capacity:
 - a. Refrigeration Compartment Volume: 17.2 cu. ft.
 - b. Freezer Volume: 8.6 cu. ft.
 - c. Total Capacity: 25.8 cu. ft.
- 4. General Features:
 - a. Configuration: French Door with Pull-Out Freezer Drawer below.
 - b. Temperature Management Features: Turbo Cool setting.

- c. Temperature Management System: TwinChill™ Evaporators.
 - d. Defrost Type: Frost Guard.
 - e. Control Type: External Electronic Digital Temperature Display.
 - f. Dispenser: Cubes, Crushed Ice and Water, Large Color-Matched.
 - g. Dispenser Features: Door Alarm; LED Dispenser Light; Water Filter Indicator Light.
 - h. Icemaker; Space Saving Ice.
 - i. Water Filtration: Advanced Filtration System; (RPWFE); Removes Pharmaceuticals.
 - j. Filter Location: Left wall.
 - k. Fresh Food Cabinet Drawers: 1 Full-Width; 2 Adjustable Humidity; 3 Total.
 - l. Fresh Food Cabinet Shelves: 4 Spill Proof; 4 Split Adjustable; 1 Full-Width; 5 Total – Glass.
 - m. Fresh Food Door Bins: 2 Adjustable; 3 with Gallon Storage; 6 Total
 - n. Freezer Storage Baskets: 2 Full-Width
 - o. Freezer Features: Interior Lighting - LED (2); Turbo Freeze
 - p. Exterior Style: Free-Standing.
 - q. Leveling System: 2 Front Leveling Legs.
 - r. Performance Features: Easily Removable Door Gaskets; Sabbath Mode Capable.
- 5. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 - 6. Front Panel(s): Stainless Steel.
 - 7. Appliance Color/Finish: Stainless steel.

2.3 MICROWAVE OVENS

A. Microwave Oven: Freestanding microwave oven, listed by UL.

Basis-of-Design Product: GE Profile™ Series; Model# PES7227SLSS, 2.2 cu ft. capacity, Countertop Sensor Microwave Oven

- 1. Type: Conventional.
- 2. Mounting: Countertop.
- 3. Dimensions:
 - a. Width: 24 inches.
 - b. Depth: 18-1/2 inches.
 - c. Height: 13-1/2 inches.
- 4. Total Capacity: 2.2 cu.ft.
- 5. Features:
 - a. Control Type: Electronic Touch.
 - b. Cooking Technology: Microwave.
 - c. Electronic Digital Display with Clock: Yes (LED).
 - d. Instant On Controls: Yes.
 - e. Microwave Watts (IEC-705): 1100.00 Watts
 - f. Power Levels: 10.
 - g. Sound Volume Control: On/Off.
 - h. Timer (On/Off): Yes.
 - i. Turntable: Glass Recessed.
 - j. Turntable Size: 16.50 in.
 - k. Microwave Sensor Cooking Controls: Beverage; Defrost: Weight/Time; Healthy Menu; Melt/Softening; Popcorn; Potato; Reheat; Vegetable.
 - l. Control Features: Add 30 Seconds; Cancel/Off; Clock Saver; Cook Time; Help; Power Level; Set Clock; Sound; Start/Pause; Timer On/Off

- m. Microwave Oven Interior: Epoxy Coated.
- n. Power Cord Length: 41".

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Colors: Provide manufacturer's standard colors as specified, or as selected by the Architect.
- D. Wherever residential equipment by more than one manufacturer is installed in the same area, provide items with matching color, unless otherwise selected by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations.
- B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 ADJUST AND CLEAN

- A. Testing: Test each item of residential equipment to verify proper operation. Make necessary adjustments.
- B. Accessories: Verify that accessory items required have been furnished.
- C. Cleaning: Remove packing materials from residential appliances and leave units in clean condition, ready for operation.

END OF SECTION

01/04/19

SECTION 11 40 00

FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Equipment and fittings specified, shown, and described in these Specifications.
- B. Utility lines: Wiring and piping required within equipment or component configuration. Terminate lines at designated and accessible points for connection in field. Exposed lines shall be chrome-sleeved or chrome plated.
- C. Electrical: Switches, terminal boxes, circuit panels, cords and plugs, controls, solenoid valves and motor starters for equipment provided herein; electrical receptacles mounted in or on Foodservice Equipment, where applicable.
- D. Plumbing: Sink faucets, drains, strainers, and tailpieces; vacuum breakers, where attached to equipment; equipment fill faucets.
- E. Hangers to structural ceiling (but not fittings in structure) to support suspended foodservice equipment, where applicable unless specified otherwise.
- F. KEC to coordinate and verify all requirements of Owner, Purveyor, Operator, Other, etc. equipment items that are located within the kitchen & server areas and indicated on FS series drawings or within specification section 11 40 00.

1.2 RELATED WORK

- A. Equipment furnished as part of this section, but installed as part of work within other sections:
 - 1. Fittings: Where applicable, furnish electrical and mechanical fittings, valves, switches, controls, regulators, strainers, and devices required for the proper operation of the equipment except as specified otherwise herein. Where such items are not mounted on the equipment, furnish items to the appropriate contractor the building site for installation in the utility lines.
 - 2. Water Treatment Devices: Furnish cartridge type filters for installation in potable water, ice making equipment or steam equipment. Devices shall be manufactured by "Cuno", appropriate to equipment, and installed by Plumbing Contractor. Provide isolation and bypass valves for the filters.

1.3 ARCHITECTURAL / STRUCTURAL / MECHANICAL / PLUMBING / ELECTRICAL WORK

- A. Utility rough in, utility lines and final connections between rough-in and foodservice equipment are part of Plumbing, Mechanical and/or Electrical drawings and specifications.
- B. Installation of mechanical and electrical fittings and devices in utility lines, including inter-connecting field wiring/piping between foodservice equipment are part of Plumbing, Mechanical and/or Electrical drawings and specifications.

- C. Final disconnects electrical receptacles in building structure; contactors; and conduit in structure required for electrical lines are part of Electrical drawings and specifications.
- D. Floor drains, floor sinks, P-traps, shut-off valve, grease traps/interceptors, water heaters, pressure reducers and regulators are part of Plumbing drawings and specifications.
- E. Ductwork from exhaust hoods to building exhaust or supply fans; flue pipes; exhaust fans for hoods; room ventilators, and air supply blowers are part of Mechanical drawings and specifications.
- F. Backing plates or blocking in wall or ceiling partitions are part of Architectural / Structural drawings and specifications.
- G. Fittings secured to structural ceiling to accommodate hangers for foodservice equipment are part of Structural drawings and specifications.
- H. The forming of architectural enclosures, floor, wall openings or recesses for foodservice equipment are part of Architectural / Structural drawings and specifications.
- J. Caulking and sealing of Cold Storage Room floor sections to building floor are part of architectural drawings and specifications.
- K. Finish floors (masonry or poured-in-place) in cold storage rooms, concrete curbs and pads are part of Architectural / Structural drawings and specifications.
- L. All drop-in equipment to be wired with waterproof conduit.

1.4 QUALITY ASSURANCE

A. Qualifications:

- 1. At least 5 years' experience in this type of work. Upon request provide at least three references for jobs of similar size and content.
- 2. Commercially manufactured equipment is not acceptable unless evidence furnished that similar equipment has been operating successfully in a minimum of three (3) installations (excluding testing laboratories, field-testing or prototypes) for at least one (1) year.
- 3. Commercially manufactured equipment will be reviewed based on submittal data provided on manufacturer's literature and/or manufacturers shop drawings for prime alternate or substituted items. Failure of the equipment to meet the capacity, operation, size, utility and production as submitted will result in the rejection of the equipment regardless of disclaimers. All equipment items where available to be provided as Energy Star rated and listed.
- 4. Custom-fabricated equipment shall be manufactured by a foodservice equipment fabricator with at least five (5) years' experience in this type of work, who has the plant, personnel, and engineering facilities to properly design, detail and manufacture high quality kitchen equipment.

B. References:

- 1. ADA - American Disabilities Act.
- 2. AGA - American Gas Association
- 3. ANSI - American National Standards Institute.
- 4. ASHRAE - American Society of Heating, Refrigerating and Air-

			Conditioning Engineers, Inc.
5.	ASME	-	American Society of Mechanical Engineers, Inc.,
6.	ASTM	-	American Society for Testing and Materials.
7.	BOCA	-	Building Officials and Code Administrators.
8.	ETL	-	Electric Testing Laboratory.
9.	FDA	-	U.S. Food and Drug Administration.
10.	ICBO	-	International Conference of Building Officials.
11.	NBFU	-	National Board of Fire Underwriters.
12.	NEMA	-	National Electrical Manufacturers Assoc.
13.	NSF	-	National Sanitation Foundation.
14.	PS	-	U.S. Dept. of Commerce Product Standards.
15.	IBC	-	International Building Code.
16.	UL	-	Underwriters Laboratories, Inc.
17.	USDA	-	United States Department of Agriculture.

C. Requirements of Regulatory Agencies:

1. NSF Compliance: Equipment subject to NSF approval shall be so labeled, or shall be constructed in accordance with applicable published NSF standards.
2. Evaporators to be NSF approved; electrical components UL (or ETL) approved.
3. Electrical Equipment: Equipment shall carry UL (or ETL) approval and comply with applicable standards of the National Electric Code. Where specified, items shall be UL approved as a unit; if not so specified component electrical parts shall be approved separately. Where applicable, equipment shall comply with NEMA and NBFU standards. Where local regulations permit, a certified test report by an approved nationally recognized independent testing organization establishing proof of conformance to the standards, including test methods of UL, will be considered in lieu of UL label. All drop-in equipment to be wired with waterproof conduit.
4. Civil Authorities: Comply with ordinances, codes and regulations of civil authorities having jurisdiction at Job Site.
5. Sheet Metal Fabrication: Comply with NFPA standard No. 51: "Welding and Cutting"; and applicable NSF standards.
6. ADA Compliance: Installation and construction of equipment and furnishings to comply with the American Disabilities Act as described in the Department of Justice Register Volume 56, No. 144. Food service aisles shall be a minimum of 36" wide and tray slides shall be mounted at 34" maximum above the floor. Food service equipment requires to be accessible shall conform to all reach requirements in CBC figures 11B-16 and 11B-17.
7. Install equipment in accordance with published SMACNA guidelines for a zone 4 projects.

1.5 DISCREPANCIES

- A. In the event of discrepancies within the Contract Documents the Consultant, shall be so notified, within sufficient time, to verify, correct and create addendum.
- B. If, in the event that time does not permit notification or clarification of discrepancies prior to the Bid Opening, the following shall apply: The drawings govern in matters of quantity, and the specifications govern in matters of quality. In the event of conflict within the drawings involving quantities, or within the specifications involving quality, the greater quantity and higher quality shall apply. No additional allowances will be made because of errors,

ambiguities, or omissions, which reasonably should have been discovered during the preparation of the Bid.

1.6 ACCEPTABLE MANUFACTURERS

- A. Where such term is followed in the specifications by the names of one or more manufacturer, such manufacturer may be substituted for prime manufacturer named, providing that the alternate item is equal or superior to the brand specified in terms of construction, function, efficiency, and utility. Burden of proof will be on the Contractor. The Contractor shall note such alternates in his Bid. Acceptance of Contractor's Bid does not imply acceptance of alternate items. The Contractor is responsible for any additional costs associated with changes required to building construction and utility due to alternate equipment items (i.e.: larger/smaller electrical breakers/wiring; increase in propane gas/water piping size and/or consumption).
- B. All alternates of Energy Star rated / listed equipment to also be Energy Star rated or listed to be considered as equivalent.

1.7 SUBSTITUTIONS

- A. Requests for substitution of equipment manufactured by other than the Prime or Alternate Manufacturers named in the specification shall be submitted prior to bid opening. Such items will be reviewed and accepted or denied during the bidding period only and accepted or rejected on the basis of equality to the prime equipment specified.
- B. Contractor Must: Submit full descriptive and technical data, test results in detail, and samples, if requested, to be received by the Architect in accordance with Division 1 Specifications.

1.8 SUBMITTALS

- A. All submittals to be provided in electronic PDF format. Minimum sheet size for all shop drawings to be 24"x36".
- B. Submittals to be provided in the following sequence. 1-Underground utility penetration MEP plan; 2-Itemized equipment cutsheets; 3-Manufacturers shop drawings (hoods, walk-ins, refrigeration systems or other); 4-MEP Rough-in Shop drawings and 5 -Custom fabricated equipment (counters/tables etc.) shop drawings.
- C. Product Data:
 - 1. Equipment Brochure:
 - a. Provide list of equipment items with item number, manufacturer, and Model No. and quantity in front of product data books.
 - b. Form: Print item number clearly in upper right hand corner of each sheet; show manufacturer's name; model number; options, alternates, or attachments, electrical and mechanical data, and valves, regulators, controls, and devices provided. If no printed data exists, submit required information on manufacturer's drawing(s) in form described below for Shop Drawings; insert reference sheet in brochure in number sequence referring to item number, manufacturer, and drawing number. Include Company's name and address, project name, and submittal date on brochure cover.

D. Shop Drawings: Submit the following along with equipment brochures:

1. Floor Plans: No less than 1/4" to 1'-0" scale. Include itemized equipment layout(s), equipment schedules, and rough-in plans. Reproductions of Contract Documents for purposes of shop drawing preparation are not acceptable.
2. Rough-In Plans: Include mechanical and electrical equipment requirements, including Owner, By Other, By Vender, etc. furnished equipment. Identify connection points, and identify and dimension rough-in points (including those presently sleeved, if) with both vertical (above finished floor), and horizontal dimensions from column centerlines or exterior walls. Detail and dimension structural recesses and depressions required for equipment provided.
3. Shop Details: KEC/Fabricator is required to provide shop drawings for approval by consultant, prior to fabrication. Scale: not less than 3/4" to 1'-0", larger where required for clarity. Show plans, elevations, sections and details of equipment as required to indicate arrangements, construction, and connection with other Work; Kinds, types, grades, thickness and finishes of materials; reinforcements, joints, bracing, supports, and anchorage; and method of installation. KEC/Fabricator to coordinate fabrication/installation of counter with equipment items that are to be dropped into top, roll under and be attached to/through counter (sneeze guards, cooking equipment, etc.). Note: All fabrication drawings that are a combination of multiple fabricated or custom manufactured components/items are to be provided as one shop drawing, no exceptions. All fabrication shop drawings are to indicate equipment cut-out requirements/dimensions. Shop drawings to include multiple sections through counter/equipment/sneeze guards (provide minimum (3) three sections serving counter). All drawings to show, at a minimum in plan view, the equipment items (below) (counters, etc.) that are covered by the sneeze guard. Side views to indicate compliance with NSF codes for sneeze protection.
4. Backing Drawings: Submit separate drawings locating architectural backing required to support equipment. Dimension in plan, elevation, and (where required) in section. Show maximum load factors for each item requiring wall, ceiling, or special floor support.

E. Certificates: Provide certifications of compliance with requirements of governing regulatory agencies.

F. Operating and Maintenance Data:

1. Refer to the following and Division 1 specification requirements.
 - a. Inventory List: Before final payment, submit an "as-built" list of equipment provided indicating item number and name; manufacturer and model, where applicable; and item price. Include extra equipment, if, ordered during the progress of the Work.
 - b. Mechanical Refrigeration: After installation, submit an "as-built" diagram of refrigeration piping system including location, manufacturer and model number of gauges, valves, shock absorbers and devices.
2. Service Agencies: After award of a contract, submit a list of names and addresses of service agencies to be used on the project. Agencies shall be approved by the Owner Representative and shall be from the jobsite area or within a 150 miles radius from the project.
3. Nameplates: Provide permanently affixed, corrosion resistant nameplate, proportionate to size of fixture, bearing manufacturer's name, model and serial

numbers, and ratings and characteristics for servicing and maintenance, where applicable, on each item of equipment.

4. Operating and Maintenance Manuals: Upon substantial completion of project, provide completed, bound manuals for each applicable item of equipment provided. Include operating and maintenance instructions/diagrams, wiring diagrams and replacement parts lists/diagrams. Provide list of serial numbers corresponding to each Item Number in the front of each manual.

G. As-Built Shop Drawings: Submit the following at project completion.

1. As-Built/Constructed equipment Floor Plans: No less than 1/4" to 1'-0" scale. Include itemized equipment layout(s), equipment schedules, and rough-in plans.
2. Rough-In Plans: Include mechanical and electrical equipment requirements, including Owner, By Other, By Vender, etc. furnished equipment.
3. Drawings to include incorporation of all provided responses to RFI's, change requests or/and any other changes incorporated in the field documented or

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Equipment:

1. Coordinate delivery with proper schedule and jobsite conditions.
2. Deliver equipment in manufacturer's original packaging, clearly identified as to product, manufacturer, and Item Number corresponding to numbers in the itemized specification.
3. Where possible, deliver each item of equipment in one (1) piece. If not possible, assemble equipment in the building in accordance with workmanship standards specified herein.

B. Storage of Equipment:

1. Store equipment in protected areas, in manufacturer's original packaging where possible, in such a way as to prevent damage to equipment and finishes, and to the structure. Damaged or defective materials and equipment shall be replaced at no cost to the Owner.

1.10 SITE CONDITIONS

- A. Examine appropriate existing job site areas and notify Owners Representative if conditions exist which will impede, inhibit, or prevent the contractor from completing the Work. In the absence of such notification it will be assumed that no such conditions exist.
- B. Verify site conditions and dimensions prior to production of all equipment items, notify GC of any conditions that affect ability to complete scope of work. Any fabricated/buy-out equipment items that are to abut and be sealed to walls must not have any gaps greater than 1/8" – if gaps exceed dimension the GC and Design team can reject and or accept on a condition by condition bases. All costs associated with replacing improperly provided equipment items is the responsibility of the kitchen equipment contractor.

1.11 COORDINATION

- A. Coordinate work as part of this phase, including but not limited to Mechanical, Electrical and Foodservice Equipment Installation. Do cutting, drilling, and fitting in equipment necessary to accommodate work of mechanical and electrical connections.

1.12 WARRANTIES

- A. Work shall be guaranteed against defects for one (1) year from the date of operation of the equipment. Guarantee shall cover replacement of every particular piece of defective material, including transportation, installation and labor, but shall exclude replacement cost of damaged parts or work caused by carelessness or misuse of the equipment. If the contractor fails to respond to written notification of warranty item within 10 days, the Owner may then have the defects and/or problem corrected at the contractor's expense.
- B. In addition to the standard warranties, for equipment, guarantees or warranties offered by manufacturers or contractors in excess of the standard warranties (for example, 5-year warranties on motor-compressors) shall be consigned to and deemed to run to the benefit of the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURED EQUIPMENT

- A. General: Equipment so identified refers to Item bearing a manufacturer's name and/or model number. Such standard materials, components, and features normally furnished for that model, whether noted or not, are inherent in the specification.
- B. Utility Requirements: Major deviation from the utility requirements shown or specified, resulting either from change of model or manufacturer, or from submitted alternates, shall be clearly indicated on the submittals. Additional costs incurred, as a result of a failure to do so shall be borne by the general contractor.
- C. Sanitation: Manufactured equipment shall be either sealed to walls, with no openings or crevices between wall and equipment, or shall be installed the proper distance from wall, as required by NSF. Wall shelving shall be 1" minimum from wall or sealed thereto.

2.2 MATERIALS

- A. General: New and first grade. See also various types of equipment, e.g., Sheet Metal Work.
- B. Metal:
 - 1. General: Metal gauges specified are minimum and refer to U.S. Standard Gauge for sheets and plates and to Stub Gauge for tubular material. Gauges established after polishing in accordance with ANSI standards.
 - 2. Stainless Steel: ASTM A167, type 304, 18-8, No. 2D finish on totally concealed surfaces, No.4 finish elsewhere.
 - 3. Galvanized Steel: ASTM A525 with G90 galvanized (1.25 Commercial) coating, stretcher-leveled, bonderized, and re-rolled for smooth surface. Galvanized edges

for protection equal to finished surfaces.

4. Steel shapes and angles: ASTM A36.
 5. Metal Tubing and piping: Seamless or welded, of true roundness or square. Seamless tubing: annealed, pickled, and ground smooth. Welded tubing: heat-treated and quenched to eliminate carbide precipitation, drawn true to size and shape, ground smooth.
 6. Chrome-Plating ASTM spec A166-45T, Class A, or ordinary finish.
- C. Galvanizing Repair Compound: USDA approved and UL listed (components), "Z.R.C. Cold Galvanizing Compound", or General Electric "Silastic".
- D. Sound Deadening: Under sheet metal tops apply sprayable, non-combustible cellulose fiber material "Catalog number K-13", type "A", National Cellulose Corporation, or equal.

2.3 FABRICATION, STAINLESS COUNTERS, STAINLESS TABLES

- A. General: The following standards apply to new construction and to modification of existing equipment:
1. Welding: Heliarc or electric arc method, welding rod of same composition as parts welded. Joints finished smooth, polished, and reground. No weld visible on exposed surface. Welding shall be non-toxic on surfaces exposed to unpackaged food. Provide continuously welded joints for fixture tops, shelves, face joints in base cabinets, field joints and others where required.
 2. Finishing: No depressions, warpage, burns, brake bend marks, burrs, fins, or irregular projections. Welds on galvanized steel: grind smooth, clean, and coat with acceptable galvanizing repair compound. No tinning. Painted galvanized surfaces: remove film with phosphoric acid or similar solution: apply wash primer surface preparation coat; color as selected. Brass surfaces: Apply clear lacquer finish to brass fixtures after fabrication.
 3. Sanitation: Close hollow sections in fixtures by continuous welding. Cove horizontal and vertical intersections of sheet metal 5/8" radius, minimum, unless otherwise specified. Install fabricated equipment, with relation to the wall, as described above for manufactured equipment, including wall shelves.
 4. Fastenings: Where possible, no exposed bolt, screw or rivet heads. Bolts and screws: Acceptable concealed type, corrosion-resisting steel same composition as metal surface. Where concealed fastenings not possible: stainless steel countersunk, of flat or oval head design. All-American Standard Unified thread design. Threads visible or accessible capped with lock-washers and chrome plated brass or bronze acorn nuts. Others capped with standard lock-washer and steel nut.
 5. Catalog Items: Construction standards herein apply to custom-fabricated equipment. Where similar items are referred to by manufacturer and model number, the manufacturer's standard construction as published in the literature (unless modified within the specification) shall be considered the construction standards for that item.
- B. Construction Standards:
1. Work tops: 14-gauge stainless steel. Lower edges of tops 3/4" minimum from table framing. Tops at 34" from finished floor unless otherwise specified. Backsplashes: At walls or higher fixtures, formed of same piece as top with 1" return standard, 2-1/2"

minimum where piping or conduit required. Form as detailed. Seal top to wall with clear silicone sealant. Close ends with continuously welded fillers of same material. See "Materials" for sound deadening.

2. Three compartment utensil sinks: 12 gauge stainless steel tops.
3. Reinforcing: Weld to underside of tops, 14-gauge steel hat sections or channels, full perimeter with cross members at 36" O.C. maximum. Concealed framing (in enclosed cabinets or behind turned down edges): galvanized steel. Exposed framing: stainless steel.
4. Aprons: Material specified. Weld to underside of fixture top framing. Bottom edges turned back 1/2" on obtuse angle. Form corners on radius around legs.
5. Open bases: Provide 1 5/8" inch O.D. x 16 gauge stainless steel tubular legs fitted at top to tubular, fully enclosed, slip-fit, reinforced leg sockets welded to table framing and at bottom to stainless steel adjustable "bullet" type feet. Pins and floor flanges, where specified: stainless steel, welded to feet. Legs connected by cross rails, same material and finish, except where shelves are located, or where front access is required for bins. Rails at 10" O.C. above floor, unless otherwise shown. Provide four (4) legs for tops up to 84" long, six (6) legs for larger tops.
6. Rolled Edges: Rolled edges shall be as detailed, with corners bullnose, ground and polished.
7. Coved Corners: stainless steel Foodservice equipment shall have 3/8" or larger radius coves in horizontal and vertical corners and intersections per N.S.F. standards.
8. Closures: Where ends of fixtures, splashback, shelves, are open, fill by forming the metal, or weld sections, if necessary, to close entire opening flush to walls or adjoining fixtures.
9. Undershelves, Open: 16-gauge stainless steel. Square down free edges, notch around legs, continuously weld. Turn up edges abutting walls or fixture 2 inches minimum and hem back. Reinforce underside as for tops.
10. Draintables:
 - a. General: 14-gauge stainless steel. Pitch to drainage point 1/4" per lineal foot with 1-inch maximum pitch. Low point of top: 34" from floor. Secure and make watertight connections to warewashing machines. Free edges standing rolled type unless otherwise specified, other edges formed into backsplashes as specified for worktops. Continuously weld disposer cones to table. Reinforce top as above for worktops, with additional lateral members on each side of cone. Mount on open bases unless otherwise specified. Drainboards more than 24" long shall be leg supported.
 - b. Standing rolled edges: Turn up at 90 degrees, roll outward and downward 180 degrees on 1-1/2" inch minimum outside diameter. Outside corners rounded on 2" radius. Top of roll; 37" from floor, 3-inches maximum from drain table top.
11. Sinks:
 - a. General: 14-gauge stainless steel, fully coved, continuously welded. Pitch sink bottom to die formed drain opening, depressed below sink bottom. Continuously weld sink bowls to fixture tops. Specified sink depth measured

from adjoining surface or, if freestanding, from 34" inches from floor. Provide faucets and drain fittings as specified.

- b. Multiple-compartment sinks: Space bowls a minimum of 2" apart. Top closure 14-gauge stainless steel continuously welded to sink bowls, rounded on 5/8" radius minimum. Weld two (2) 1/2" diameter stainless steel rod spacers between each bowl 2" from bottom, one (1) each at front and rear. Scullery and vegetable washing bowls shall be leg-supported. Weld 16-gauge stainless steel, full height closure panel across front and ends of sink bowls, construction vermin-proof, NSF approved. Scullery and vegetable washing sinks are to be integral with the body. Welded in sinks not acceptable.

12. Counter-Mounted Equipment (Electrical/Mechanical):

- a. General: Install built-in equipment neatly and tightly in accordance with manufacturer's instructions; no crevices or gaps acceptable. Install wiring and piping for all elements, controls, and fittings within counter to accessible junction point. Conceal lines and fittings in base cabinets, tubular uprights, raceways. Where required, cut holes in counter tops for wiring and piping, and install rubber grommets for cords. All foodservice equipment with remote controls or exterior wiring to be installed with liquid-tite.

13. Elevated Shelves:

- a. General: 16-gauge stainless steel, free edges squared-down as for undershelves, unless otherwise shown. Turn up edges abutting walls or other fixtures 1" minimum and crimp back for tight fit. Close free ends. Mount at 18" above work surface unless otherwise shown. Reinforce underside of shelves 14" deep or greater.
- b. Wall Shelves: Stud or tack-weld to 12-gauge stainless steel cantilever brackets. Secure brackets to wall rigidly on 36" 0-inches centers, maximum.

C. Manufactured Components (Unless specified otherwise):

- 1. General: Provide the following items, or approved equivalents, for installation in custom-fabricated equipment where applicable at all sinks etc.
- 2. Faucets:
 - a. General: Removable-cartridge type, with polished chrome finish, and fitted with aerators, as manufactured by Chicago, Inc., or equivalent models by Fisher Faucet.
 - b. Swing Spout, Standard: Deck-or-splash-mounted, as shown. For sinks 30 Gal. or larger: Chicago #540-LD-L9 with 3/4" NPT inlets: for smaller sinks: Series B-230 with 1/2" NPT inlets. Nozzle lengths equal to one-half width of sink or as specified and shown.
 - c. Provide deck or splash mounted pre-rinse at pre-rinse sink, Chicago #919 or 510GC with wall bracket.
- 3. Drain Fittings:
 - a. Twist-handle type: Box pattern drains with heavy duty, stainless steel removable basket assembly, twist-handle waste outlet, and one-piece connected overflow assembly, by Component Hardware Group, Inc., or equivalent model by Klein Hardware. For sinks between 20 Gal. & 30 Gal.,

provide Model No. D63-4591; less than 20 Gal., provide Model No. D53-7215. Centerline of overflow connection 2" below sink top. Weld 12-gauge stainless steel strap lever support to underside of sink at front, if required. Lever handle to be installed aligned with front edge of sink bottom.

2.4 FABRICATION - MILLWORK

Not applicable to this project.

2.5 COLD STORAGE ROOMS

- A. Pre-fabricated, pre-assembled, sectional, size and configuration as shown on plan, and as verified by field dimensions, with largest possible area provided. Refer to itemized specification for exterior box installation requirements.
- B. General:
 - 1. The urethane foam core of the panels shall be certified by Underwriter's Laboratories having tested and in accordance with UL Standard 723 (ASTM Standard E-84).
 - 2. The foam core of the panels shall be tested in accordance with ASTM Standard D-1929 to determine the self-ignition temperature.
 - 3. Panels shall be tested in accordance with ASTM Standards E-72, E-455 and E-564 for determination of the structural characteristics of the panel system.
 - 4. The foam insulation shall be tested in accordance with ASTM Standard C-177 to evaluate the insulation performance of the material.
 - 5. The urethane foam core must meet the Montreal Protocol for reduction of chlorofluorocarbons (CFCs).
 - 6. Certification of the above performance specifications must be provided by the indicated independent testing laboratory or by other independent agency recognized by the major model building code agency IBC.
 - 7. Construction and installation shall conform to governing seismic rating.
- C. Construction:
 - 1. Panels shall consist of interior and exterior metal skins formed with steel dies and roll-forming equipment and checked with gauges for uniformity and accuracy. The metal skins shall be placed into steel molds and liquid urethane injected between them. Urethane shall be foamed in place (poured, not frothed) and, when completely heat-cured, shall bond to the metal skins to form a rigid thick insulated panel. The expanding agent to have an inherent pressure of 38 PSI when foam is heated to 150°F. The thermal conductivity factor ("K") shall not exceed 0.118BTU; per hour per sq. ft. per degree F. Per inch. Overall coefficient of heat transfer R-28 for refrigerators/r-36 for freezers. Panels shall contain 100 percent urethane insulation and have no internal wood between the skins. To insure tight joints, panel edges must have foamed-in-place tongues and grooves with a flexible vinyl gasket also foamed-in-place on the interior and exterior of tongue edges.
 - 2. Panels except corner panels shall be made in 24" and 48" widths, and shall be fully interchangeable for easy assembly. Panels 12" or 36" wide are to be furnished only when required to fit the allocated space. To assure correct alignment and maximum

strength, corner panels shall be 90-degree angles with exterior horizontal dimensions of 12" on each side.

3. Panels shall be equipped with "Cam-Lok" joining devices. The distance between locks shall not exceed 48". Each locking device shall consist of a cam-action, hooked locking arm of a replaceable type placed in one panel, and a steel rod precisely positioned in the adjoining panel, so that when the locking arm is rotated, the hook engages over the rod and draws the panel tightly together with cam-action. An aligning device shall be provided in at least one "Cam-lok" pocket for every vertical panel. Press-fit caps shall be provided to close wrench holes.
4. PARTITIONS: Insulated metal-clad T partition panels shall be provided when compartments are to be separated. Provide thermal break between cooler and freezer compartment without using heater lines.
5. EXTERIOR FINISH:
 - a. Exposed Exterior: Stainless steel – per itemized specification
 - b. Unexposed Exterior: 20 gauge galvanized metal.
6. INTERIOR FINISH:
 - a. Ceiling: .040 Mill Finish Smooth Aluminum
 - b. Walls: .040 Mill Finish Smooth Aluminum.
7. FLOORS: Wall panels to be attached to slab via screeds. Flooring in cooler to be same material as kitchen area. GC's flooring contractor to extend flooring into cooler box and cove up interior and exterior as required per code.
8. HEATERS: Perimeter heater fitted with low watt-density anti sweat heater wires, fully-enclosed in metal, easily replaceable, for freezer door and frame heater, cooler frame heater only.
9. SANITATION: interior joints coved 1/4" minimum radius. No exposed wiring or conduit will be acceptable. Conduit and switch/alarm J boxes to be pre-installed in panel sections with recessed splice boxes at exterior ceiling panels.
10. DOORS:
 - a. Door: 36" x 80" hinged flush swing type with 20-gauge stainless steel interior and exterior, and 4" insulation same as panels. View windows in doors. Interior and exterior diamond tread kick plate (from floor to 30" A.F.F.). Provide door with strip curtains. Provide each door with a mortised dead bolt lock with interior S/S components and interior recessed release, all facility coolers and freezers keyed alike.
 - b. Door Pull: Brass chrome-plated positive door latch handle with interior safety release. Padlock provisions. Walk-in coolers and freezers shall have entry and exit door hardware that complies with all of the requirements of CBC Section 1133B.2.5.1 and maneuvering clearances at the exterior side per CBC Section 1133B.2.4.2.
 - c. Door Hinges: Three (3) per door, NSF-approved, chrome-plated, self-closing from a 90-degree open position, cam-action.
 - d. Gaskets: Satin black, commercial magnetic type, 5/8" continuous thermoplastic tape, corners welded. Floor seal: Double-bladed, adjustable, neoprene wiper gaskets. Gaskets easily replaceable and non-hardening.

- e. Door Closer: Equal to READING Model No. 602-HO, or Kason No. 1092 with arctic oil and hold-open feature.
 - f. View Window: Approximately 336 sq. in. square inches, 1/4" thick, triple-pane, condensate-free, lexan or tempered plate glass window. At freezer: heated glass, with transparent trim coating at interior on exterior panel, on same circuit as door face heater. Mount view window at 4'-0" above the finished floor, or as shown.
 - g. Refer to itemized specification for information on reach-in glass door requirements.
11. PRESSURE RELIEF PORT: A relief port shall be provided at freezer to equalize the difference of pressure between the interior and walk-in. The relief port shall be mounted away from the direct air stream flowing from the evaporator coils. Each relief port door shall be heated and have an easily replaceable heat wire.
 12. LIGHTING: Provide quantity as shown fluorescent PL type vapor-proof light fixtures with lexan diffusers, capable of operating at -10° in each compartment as shown, secured to a recessed splice box with a non-conductive stub out to exterior ceiling surface. Provide "EY" seal off's. Each door section fitted with flush mounted LED type pilot light and switch on exterior and interior with inlet box. Interior LED type pilot light, constant burning, and exterior LED type pilot light indicating. Quantity to meet 20 to 30-candle power within the box.
 13. TEMPERATURE ALARM SYSTEM: Digital system, with constant "LED" read-out display, audio warning buzzer, and remote sensor, equal to Modular Corp. model #75. Provide at each compartment. Secured to a recessed splice box with a non-conductive stubout to exterior ceiling surface. Provide "EY" seal off's. Provide a permanent label under each read-out identifying the compartments and their operating temperatures, on cooler's wall.
 14. UNIT EVAPORATOR SUPPORT: Provide a 4" x 4" aluminum plate with a Tinnerman nut retainer, and 1/2" diameter threaded nylon rod through ceiling panel.

D. Installation:

1. Trim and Closure Panels: Provide permanently mounted closure panels (of material to match exterior panel surfaces) between top of compartments and finished ceiling; and closure strips (of same material) between wall panels and architectural walls or columns.
2. Utility penetrations: Provide penetrations required at panels to accommodate electrical and refrigeration lines and sufficient quantities of 5" diameter matching escutcheon plates to dress off utility penetrations, including drain lines. Escutcheon blanks' hole cutting and sealing around penetrations to be performed by other trades.
3. Erection, installation, start-up, and testing shall be done by a California State Licensed Refrigeration Contractor, authorized by the manufacturer of the Cold Storage Room for the work.
4. Seismic Anchoring: Provide and install seismic anchoring brackets per manufacturer's recommendation and local governing seismic codes.

2.6 MECHANICAL REFRIGERATION SYSTEM

- A. Refrigeration assembly to consist of compressors, condensers and evaporators, as required for the Cooler, and accessories required for a completely installed and functional system.
- B. Pre-assembled remote refrigeration:
 - 1. The compressor shall be accessible semi hermetic type with suction and discharge service valves, crankcase heater, oil sight glass and oil charging connection. Compressor shall have an operating oil charge. Compressor motor shall be high torque, semi hermetic induction type, and shall be protected against overload, single phasing, and locked motor conditions. Cooler compressors shall use refrigerant to be per most recent Montreal Protocol. "Compressor manufacturer to be Copeland or equivalent by Carlisle or Tecumseh".
 - 2. Condenser shall be sized to a minimum of 15°F TD, medium temp compressors. Condenser coil shall be constructed of seamless copper tubes arranged in a staggered pattern and mechanically expanded into high efficiency rippled copper fins for maximum heat transfer. The fins shall have full drawn collars to completely cover the copper tube to assure a permanent primary to secondary surface bond. Condenser manufacturer to be Copeland Mfg. or equal by Larkin.
 - 3. The direct drive condenser fans shall be propeller type, statically balanced and operationally designed for low tip speeds to minimize noise and vibrations transmissions. The motor shall be totally enclosed, with vertical shaft with rain slinger. The motors will only operate when the applicable compressor is operating to minimize operational costs. The condenser fan blades shall be protected with fan guards meeting OSHA requirements. Condenser Coil to be constructed of copper tubes and copper fins.
 - 4. Tubing to dual pressure controls on compressor shall be "Super Hose" or equal, unprotected copper tubing is not acceptable.
 - 5. Provide pump-down cycle kits with solid-state limit timers, refrigeration lines, insulation, thermal-expansion valves, refrigerant pressure relief valves, back pressure valves, check valves and inlet/outlet shut-off valves.
 - 6. Temperatures will be controlled by a thermostat controlling a liquid line solenoid valves for the compressor. The thermostat will be mounted within two feet of the evaporator, in the return airflow. Freezer temperature to be -10F to -4F. Cooler temperature to be +35°F to +40°F. Solid-state timer to stop compressor after 30 seconds (adj 0-60 seconds) if pumpdown cycle does not complete.
 - 7. Refrigeration evaporator coils shall be direct expansion-type with factory installed solenoid valve, cold control thermostat and thermal expansion valves, and shall be pre-wired, pre-piped and sealed under pressure to maintain the integrity of evaporator coil and components. Low-temperature coils shall have a time-initiated, temperature-terminated defrost time switch. Interlock to prevent simultaneous compressor and defrost heater operation. Verify operation and location of medium temp coil with drawings.

2.7 EXHAUST HOODS

- A. Stainless steel construction. See shop drawings for size and location of ducts.
- B. Provide stainless steel closure panels above hood to finished ceiling, or stainless steel angle trim at hood if directly below ceiling, verify height.
- C. Lights per shop drawings.

- D. Supply wall flashing; unless specified otherwise.
- E. Provide fuse-linked fire dampers in exhaust and make-up air duct collars, if required. Verify with Fire Marshal.
- F. Hoods to utilize a wet chemical Fire Suppression System.
- G. Bottom of hood to be mounted as delineated in itemized specification.

2.8 FIRE PROTECTION SYSTEM

- A. The fire protection system shall conform to applicable code requirements including but not limited to NFPA and UL 300.
- B. Provide surface appliance, hood and duct protection nozzles per equipment shown.
- C. Exposed piping to be chrome plated or sleeved. Run unexposed wherever possible.
- D. Provide manual pull station as located on drawings with two (2) sets of normally open/close contact points.
- E. Coordinate shunt-trip circuit breaker coil voltage and interface requirements.
- F. Coordinate solenoid operated gas valve coil voltage and interface requirements.
- G. Upon completion the system must be tested in the presence of the City Fire Marshal.
- H. Permit and testing to be included in scope of work provided as part of section 11400.
- I. Provide Automan for use with single ducts on multiple hoods.
- J. Provide durable plastic maps/legends/signs at each manual pull station and for each system to show the effected hoods. Provide training for the cooks and maintenance staff as to how the system works.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Prior to fabricating, ordering, or delivering equipment verify essential measurements at the Work Site. Verify mechanical and electrical conditions having bearing on the work, as well as pertinent existing equipment and architectural conditions. Make every effort necessary to clarify conditions not accessible to visual examination. Any fabricated/buy-out equipment items that are to abut and be sealed to walls must not have any gaps greater than 1/8" – if gaps exceed dimension the GC and Design team can reject and or accept on a condition by condition bases. All costs associated with replacing improperly provided equipment items is the responsibility of the kitchen equipment contractor.
- B. The kitchen equipment contractor is responsible to locate all equipment in the field for installation by themselves or any of their subcontractors – this includes both buy-out and custom fabricated equipment items. Contractor to coordinate installation with installed rough-ins and make any adjustments required to equipment to accommodate.

3.2 INSTALLATION

- A. Cutting and Welding Operations: gas operated cutting and welding equipment and operations shall be in strict accordance with the National Fire Protection Association Standard No. 51.
- B. Standards: Comply with NSF standards in methods of installing, mounting, and securing equipment.
- C. Trim: Where separate fixtures abut each other as in a battery of cooking equipment, join, seal, and fit with matching trim strips to eliminate crevices. Where fixtures penetrate or abut walls, fit wall edges with trim molding, of matching material, to close spaces between fixture and building structure. At wall penetrations mount fixture on enclosed channel base of similar material to close spaces, where specified.
- D. Irregular Surfaces: Where fixture abuts curved or irregular surfaces or angles, or projecting wall corners, fixture shall conform to such surfaces.
- E. Metal Bases: Set bases in solid, full-perimeter bed of sealant. If space exceeds 1/4" at point, provide a continuous, full-height scribe strip of matching material to conceal gap.

3.3 FIELD QUALITY CONTROL

- A. After installation, test mechanical and electrical equipment including, but not limited to refrigeration systems, and in general valves, regulators, tubing, wiring, piping, connections, gauges, safety devices, sensors, and other devices required for the proper operation of the equipment, for operating efficiency and conformance to requirements specified. Test and re-test until equipment is properly operating.
- B. Manufacturer's representative Field Service: Representatives of the Food Service Equipment and Accessory manufacturers shall make inspections prior to start of installation, during installation and upon completion of installation to ascertain that the entire system(s) has been installed according to manufacturer's specifications and approved details.

3.4 ADJUSTMENT AND CLEANING

- A. Perform fitting, joining, leveling, fastening, scribing, sealing, and adjusting of fixed equipment; depot mobile and portable equipment as shown. Do cutting, drilling, and fitting in equipment necessary to accommodate work of mechanical and electrical trades.
- B. Cleaning: Remove from equipment stains, paint spots, protective wrappings, coatings, tapes, grease, oil, plaster, dust, polishing compounds, rust, and other foreign substances.
- C. Touch-up: After installation, damaged, stained, or otherwise disfigured portions of the work shall be touched up, refinished, or replaced to the satisfaction of the Owners representative.

3.5 DEMONSTRATION/COMMISSIONING

- A. Prior to final acceptance, KEC is to schedule and provide for factory authorized representative or service agent to demonstrate and instruct operating personnel in the uses and maintenance of all equipment provided – No exceptions. In the case of complex equipment, demonstrations shall utilize videotapes as provided by the manufacturers. Such equipment shall include but not be limited to major cooking equipment; exhaust ventilation systems, food processing equipment (such as cutters, mixers, slicers); warewashing

equipment; and complex control, monitoring, and alarm systems. Provide RAS with schedule of start-up and demonstrations.

B. Process of commissioning of equipment to include the following:

1. Factory authorized representative or service agent to verify that all utility connections are complete and proper per manufacturer's requirements and specifications.
2. All equipment to be started up and tested for proper operation by the factory authorized service agent or representative. Start-up and testing done by the G.C. does not constitute acceptance by Owner, owner's representative and/or design team.
3. At time of start-up a commissioning form is to be completed and signed by the factory representative or authorized service agent that has performed the work. Form to indicate date, time, name and company name of representative, equipment item # and description, duration of visit, and names of staff equipment demonstrated to. Contact RAS Design for copy of form to be completed.

3.6 PROTECTION

- A. Cold Storage Room: In order to prevent usage of this room for general storage by other trades prior to completion, lock Cold Storage Rooms before leaving the site and verify other requirements by manufacturer.

3.7 ITEMIZED EQUIPMENT DESCRIPTION

- A. Refer to all FS Drawings as they are inclusive as the construction documents and therefore pertinent with this specification to the details of this contract. In the event of a conflict, the greater quality of the two in conflict shall apply.
- B. Refer to contract document drawings for quantities required, general notes, utility load requirements etc.
- C. Provide ADD Alternate for seismic installation per SMACNA Guidelines.
- D. Provide allowance for providing and installing "Posi-Set" Caster Placement devices as manufactured by Dormont at all portable/mobile cooking equipment items, below exhaust hoods. Install only if required by Fire Marshal.
- E. Contractor is required to list name of intended custom fabrication company at time of bid.

Item 1: Air Curtain, Unheated

Manufacturer: Mars Air Systems

Model: LPV248-1U*

Acceptable Alt: Berner International Corporation

1. Air Curtain, LoPro Variable Speed Commercial Model, Unheated, 48" long, double shaft motors, for doors up to 8-feet high, mounted adjustable speed controller knob, one 1/6 HP motor.
2. Level 1 control package, line voltage, combination plunger/roller door limit switch, for instant on/off control.
3. Control package mounting brackets.
4. Remote switch.
5. Above door header mount.

Item 2: Front Load Washer

Manufacturer: Kenmore

Model: 41392

Acceptable Alt: Maytag

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. 4.5 cu. ft. White Front-Load Washer with Smart Motion technology, Accela Wash, Cold Clean Option, Energy Star, Noise Reduction, adjustable legs, electronic LED controls, stainless steel wash basket.
2. 6 ft. cord, 27"W x 30"D x 39"H, 203 lbs.

Item 3: Front Load Dryer

Manufacturer: Kenmore

Model: 81182

Acceptable Alt: Maytag

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. 7.4 cu. ft. white electric dryer with sensor dry, sanitize cycle, wrinkle guard, capacitive touch controls, NSF, adjustable legs.
2. 6 ft. cord, 27"W x 30"D x 39"H, 127 lbs.

Item 4: Cabinet, Wall Mount

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Cabinet, wall mount, enclosed design with (2) sliding doors, with single intermediate shelf, 18/430 stainless steel construction, NSF.
2. With adjustable shelf.
3. Field verify dimensions prior to fabrication and installation.

Item 5: Lockers, Wall Mounted

Manufacturer: Penco

Model: 68123R028

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2 Products, Part 3 - Execution and the following:

1. Assembly to consist of 12x12x36 individual lockers set 2 high x 3 wide. Quantity per plan; verify quantity prior to purchase.
2. Recessed Handles. Provide (1) one assembly ADA compliant.
3. Flat Top.
4. 6" high Legs to be removed and units to be wall mounted.

Item 6: Sink, Mop

Manufacturer: Advance Tabco

Model: 9-OP-48

Acceptable Alt: Eagle Metal Masters or Custom Fabricated

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Mop Sink, floor mounted, 33"W x 25"D x 16"H (overall), 28"W x 20" front-to-back x 12" deep (bowl size), free flow drain with 2" IPS outlet, stainless steel construction.

Item 7: Faucet, Utility

Manufacturer: Fisher

Model: 97659

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Service Sink Faucet, wall mount, with 8" adjustable long spout, vacuum breaker, nipples, elbows.

Item 8: Mop Rack
Manufacturer: Advance Tabco
Model: K-242
Acceptable Alt: Eagle Metal Masters or Custom Fabricated
Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following
1. Mop Hanger, 23", accommodates (3); wall mounted.

Item 9-10: Not Used

Item 11: Walk-In Cooler/Freezer
Manufacturer: Pacific Refrigerator
Model: 8'-10" Int. Height
Acceptable Alt: RMI or Thermal-Rite
Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Assembly to be 8'-10" overall interior height from finished floor to bottom of ceiling panel. Length, width and configuration as shown on plans. Field verify dimensions prior to fabrication.
2. Provide per General Specifications section 2.06 part 7 Flooring.
3. LED Lights; quantity per plan FS-102.
4. All exposed exterior areas to be 22 Ga Stainless Steel.
5. Provide closures to ceiling, same finish as exposed exterior face of cooler.
6. All unexposed exterior areas to be 20 ga. Galvanized steel
7. No exposed conduit in box.
8. Refer to general specifications
9. Provide Modularm 75 temperature alarm. Digital temperature alarm with contacts for remote operation/sensing.
10. All panels to be minimum 4" thick.
11. Provide corner guards on any exposed corners. Match finish to box.
12. Provide closure trim between adjacent walls. Match finish to box.
13. 80" high doors, three hinges per door; width per plan.
14. 36" high aluminum diamond tread plate kick, both side sides of door.
15. Push bar with inside safety release. Provide door handle with deadbolt lock mechanisms.
16. View windows in doors.
17. Heater wire in door and view window.
18. Self-closing hinges with snubber.
19. 3/way interior and exterior light switch & pilot light.
20. Adjustable Neoprene door sweep. Door to be provided with removable/cleanable strip curtains.
21. Pre-Wire all electrical components in door to single conduit. Take conduit up through roof panel; there is to be no exposed conduit in side of the walk-in compartment.
22. Welded aluminum frame.
23. Mortise deadbolt Keylock door hardware.
24. Verify/coordinate requirement of tile cut door; coordinate ramp height at threshold with flooring.
25. See also part 2 products of this specification.
26. Provide shop drawing for review and approval prior to fabrication and installation.
27. As part of shop drawing submittal package Walk-in manufacturer to provide Package to include Structural Calculations and drawings for pinning/attaching walk-in box per seismic Zone 4 installation requirements. Project structural engineer of record to review provided submittal documentation prior to submission to City Building department.
28. Walk-in manufacturer to provide door opening device and door hardware in compliance with CBC sections 1114B.1.2 and 1104B.5
29. Walk-in manufacturer to provide on shop drawings specifications of panels (construction material, foam etc.) and list current (International Green Construction Code) ICC-ES number or other approved listing.
30. Walk-in manufacturer to provide on shop drawings compliance with insulation requirements of the local and state Energy codes or at min the following:
 - a. Cooler walls, ceilings and doors: R-28 Minimum. Freezer R36.
31. No exposed conduit.

Item 12: Closures and Trim
Manufacturer: Stainless Steel Fabricator
Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Provide trim and closure panels to ceiling and closures between top of cooler/freezer and ceiling; 18 gauge type 304 stainless steel construction.
2. Overall dimensions per plans and field verified.
3. No exposed fasteners – utilize channel installation method.
4. Provide shop drawing for review and approval prior to fabrication and installation.

Item 13: Freezer Coil
Manufacturer: OmniTeam
Model: LLE Series

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Refer to mechanical Refrigeration section for additional information/requirements.
2. Refer to specification for item #15 and section 2.6 for overall system sizing requirements.
3. FSEC/manufacturer to verify overall system size and provide adequately sized cold room coil to maintain a temperature of -10 degrees Fahrenheit.
4. Low profile.

Item 14: Cooler Coil
Manufacturer: OmniTeam
Model: ADT Series

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Refer to mechanical Refrigeration section for additional information/requirements.
2. Refer to specification for item #15 and section 2.6 for overall system sizing requirements.
3. FSEC/manufacturer to verify overall system size and provide adequately sized cold room coil to maintain a temperature of 35 degrees Fahrenheit.
4. Low profile.

Item 15: Remote Refrigeration System
Manufacturer: OmniTeam
Model: See Details Below – Air-Cooled

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Unit to building roof mounted, outdoors. see sheet FS501.
2. Food Service Equipment Contractor/Mfr. To verify overall system sizing and adjust accordingly, if required, based on standard operational requirements and section 2.7.
3. Provide coated condenser coils.
4. Pre-assembled, plumbed and wired assembly with a single source power connection with fused disconnecting means and a branch circuit distribution panel.
5. Low profile condenser/fan coils.
6. Refrigeration lines, solenoids, thermostats, expansion valves and accessories required for a completely installed and functional system.
7. Refrigeration Contractor to coordinate installation requirements with general contractor
8. Outdoor/roof mounted installation per plans - field verify all conditions.
9. Floating head pressure type refrigeration system.
10. System to be provided with demand based defrost system/components (Heatcraft Beacon II with smart defrost or similar).
11. Coil fan motors to be electronically commutated.

Item 16: Cold Storage Shelving

Manufacturer: Metro

Model: NK3 Series

Acceptable Alt: International Storage Systems (ISS), Amco Corp.

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Provide independent NK3 series 63" high posts for all units.
2. Provide each unit in length, width and configuration to fit per area as shown plans.
3. Each unit to contain 4 NK3 series shelves equally spaced with first shelf mounted 6" above finished floor.
4. Provide all components necessary for a complete and functional installation.
5. (4) Four Independent posts for each unit/assembly.
6. (4) Four 6" swivel casters (2) two on long side with brakes.
7. 4-Tier, mobile, heavy weight capacity.

Item 17: Dry Storage Shelving

Manufacturer: Metro

Model: BR Series

Acceptable Alt: International Storage Systems (ISS), Amco Corp.

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Sizes, quantities and configuration per plan.
2. 5 tier high; 86" posts.
3. Independent posts for each, provide with adjustable seismic flanged foot.
4. Wall brackets to be installed for stability.
5. 5-Tier, heavy weight capacity.

Item 18: Hand Sink, Wall Mount, ADA

Manufacturer: Advance Tabco

Model: 7-PS-25

Acceptable Alt: Eagle Metal Masters or Aero

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. ADA Compliant Hand Sink, wall mounted, 14" wide x 16" front-to-back x 5" deep bowl, 18 gauge 304 stainless steel, deck mounted faucet with wrist handles, deck mounted soap dispenser (pump), basket drain, wall brackets, NSF, cCSAus.
2. Paper Towel Dispenser, by School District.
3. P-trap, heavy duty, 1-1/2", 17 gauge.

Item 19: Faucet, Deck Mount

Manufacturer: Advance Tabco

Model: K-56-CA

Acceptable Alt: Eagle Metal Masters or Aero

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Faucet with Wrist Handles, deck-mounted, 4" O.C.
2. CA/VT no lead faucet upgrade, conforms to California AB 1953.
3. Low-flow aerator 0.5gpm, fits 55/64-27 female and 15/16-27 male thread, Conforms to California AB 1953.

Item 20-21: Not Used

Item 22: Exhaust Hood

Manufacturer: Streivor

Model: Type 1 – See Shop Drawing Sheet FS-301

Acceptable Alt: Gaylord or Accurex

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Air volumes and overall dimensions per manufacturers shop drawings provided on FS series sheets.
2. Provide trim and closures between and under hood; 18 ga type 304 s/s construction; no exposed fasteners. Provide closure at top of hood around exterior of hood to finished ceiling or at min to cover brackets, light fixtures, etc. approx. 12".
3. 3" rear air spaces against wall and any adjacent walls; verify requirements at ceiling.
4. Hood to be all welded, minimum 18-gauge S/S interior and exterior.
5. Verify hood height with ceiling obstructions and ductwork prior to submittal.
6. Length and width per plan(s); verify with clearances per UMC requirements.
7. Do not pre-plumb hood for fire suppression system.
8. Foodservice equipment contractor to provide shop drawings for hood and enclosure for review by consultant.
9. Hood hanging height to be minimum 6'-8" A.F.F.
10. Provide with balancing dampers option.
11. Provide for additional SS closures, as required, to adjacent walls and between hood sections.
12. Provide engineering and seismic calculations for hood hanging, deferred approval by the city inspector.
13. Hood manufacturer to provide two (2) trips to job site for commissioning.
14. Provide with remote light switches.

Item 23: Closures, Trim and Wall Flashing

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Provide trim and closure panels to ceiling and closures between and under hood; 20 ga type 304 stainless steel construction; no exposed fasteners.
2. Provide and install 20 Ga. Stainless Steel wall flashing at wall 6in. AFF to 1in. above bottom edge of hood.
3. No exposed fasteners – utilize channel installation method.
4. Trim with batons and t-strips.
5. Provide shop drawing for review and approval prior to fabrication and installation.
6. Provide Closures to the finished ceiling; verify height., coordinate requirements with pass through wall opening.

Item 24: Range, Heavy Duty, Gas

Manufacturer: Vulcan

Model: V6B36S

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. V Series Heavy Duty Range, gas, 36", (6) 35,000 BTU open burners, cast iron grates, standard oven, stainless steel front, front top ledge, sides, base, burner box & stub back, 6" adjustable legs, 260,000 BTU, CSA, NSF.
2. Natural gas fired.
3. 3/4" Left rear manifold with pressure regulator.
4. Cap & s/s manifold cover, left
5. Cap & s/s manifold cover, right
6. S/S Sides.
7. Flexible gas connector kit, 3/4" x 4'.
8. Mobile on casters (locks on front).
9. With quick disconnect.

Item 25: Filler, Pot
Manufacturer: Fisher
Model: 93890

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Pot Filler Faucet, 8" OC adjustable wall valve, with 18" double-jointed swing spout, non-splash aerator, wrist handles.
2. Wall mounted.

Item 26: Range, Heavy Duty, Gas
Manufacturer: Future
Model: Not in Food Service Equipment Contract

Item 27: Oven, Retherm And Hold, Reach-In
Manufacturer: Cres Cor
Model: RO-151-FW-1332D12K

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2 Products, Part 3 - Execution and the following:

1. Quiktherm™ Rethermalization/Hold Oven, AquaTemp™, reach-in, full size, single cavity, holds (18) 18" x 26" pans or (32) 13" x 26" baskets adjustable on 1-1/2" centers, fully insulated, solid state electric control convection type oven, LED digital display, standard controls, reversible dutch doors, anti-microbial latches, (4) heavy duty 5" swivel casters (2) braked, stainless steel construction, cCSAus, CSA.
2. Key lock handle.
3. Security panel for oven controls.

Item 28: Oven, Convection, Gas
Manufacturer: Vulcan
Model: SG66D

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2 Products, Part 3 - Execution and the following:

1. Deep depth, double section gas convection oven, Vulcan-Hart Model No. SG66D. Stainless steel front, sides, top, rear enclosure panel and legs. Two interior oven lights per section. Five nickel plated oven racks per section. Eleven position nickel plated rack guides with positive rack stops. CSA design certified. NSF listed.
2. Mobile on casters.
3. Simultaneous doors.
4. Flexible gas hose with quick disconnect and restraining device. Consult price book for available sizes.
5. Down draft flue diverter for direct vent connection.
6. 2.Casters w/5" wheel 6" OA (set of 4)
7. 3.Natural gas fired, with Gas manifold, for single point connection. Provide with down draft diverter.
8. 4.Swivel casters w/front brakes (set of four).
9. 5.Natural gas Flex Hose w/Quick Disconnect & Restraining Device, 3/4" N.P.T(vfy.). x 4'-0" with restraining cable device.

Item 29: Fire Suppression System
Manufacturer: PyroChem
Model: Kitchen Knight II

Acceptable Alt: Ansul

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2 Products, Part 3 - Execution and the following:

1. System to be sized to provide coverage for hoods and equipment below at exhaust hood. System is to be installed in location per plans, see sheet FS-401.
2. System to meet current UL 300 Requirements.

3. Provide Fire Suppression Systems with one solenoid gas shut-off valve (verify with MC/PC) sized to discontinue natural gas service to the entire kitchen. Each fire suppression system to operate independent from the others in regard to means of chemical disbursement. Upon activation either via remote pull station or internal temperature controls release the system is to dump only at the hoods indicated to be covered by the specified system. Upon system activation a signal is to be sent to the solenoid valve shutting off gas supply to all cooking items contained within the one exhaust duct system. EC to provide interconnection wiring per manufacturers recommendations
4. No exposed horizontal piping.
5. Exposed vertical piping to be chrome plated.
6. Food Service Equipment Contractor to provide separate, shop drawings, permit and testing. Food Service Equipment Contractor to contract directly with licensed Fire suppression system contractor not through exhaust hood manufacturer.
7. Provide four (4) additional sets of contacts at microswitch.
8. Start Up and testing to be provided by licensed Fire Suppression Contractor.
9. Electrical shut offs in panels by E.C.
10. System to be designed to accommodate interconnection with building fire alarm system.
11. With remote fire pull.
12. Provide with type "K" fire extinguisher – By Food Service Equipment Contractor.

Item 30-31: Not Used

Item 32: Prep Table with Drawer
 Manufacturer: Stainless Steel Fabricator
 Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Custom configuration per plans. Depth x length per plans and field conditions.
2. See elevation for details.
3. 14 gauge stainless steel top. Open storage and areas below per details. Top to have standard edge.
4. Field verify all dimensions prior to fabrication.
5. 16 ga stainless steel under shelves per plans.
6. Provide shop drawing for review and approval prior to fabrication and installation.
7. Support channels below top and under shelf.
8. With 20x20x6" deep drawer, with lock.

Item 33: Stainless Steel Wall Shelves
 Manufacturer: Stainless Steel Fabricator
 Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. 16 ga stainless steel top and 14 ga stainless steel brackets.
2. Field verify all dimensions prior to fabrication.
3. Standard turn-down edge front and sides.
4. Two – tier 12" deep shelves.
5. Provide shop drawing for review and approval prior to fabrication and installation.

Item 34: Dirty Dish Storage Shelving
 Manufacturer: Metro
 Model: NK3 Series

Acceptable Alt: International Storage Systems (ISS), Amco Corp.

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Provide independent NK3 series 63" high posts for all units.
2. Provide each unit in length, width and configuration to fit per area as shown plans.
3. Each unit to contain 4 NK3 series shelves equally spaced with first shelf mounted 6" above finished floor.
4. Provide all components necessary for a complete and functional installation.
5. (4) Four Independent posts for each unit/assembly.
6. (4) Four 6" swivel caster's (2) two on long side with brakes.

Item 35: Clean Dishtable
Manufacturer: Stainless Steel Fabricator
Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Custom configuration per plans. Depth x length per plans and field conditions.
2. See elevation for details.
3. 14 gauge stainless steel top with integral rear and side backsplash. Open storage and areas below per details. Top to have straight turn-down edge.
4. Legs to be 1 5/8" 16 Ga. stainless steel tubular type with CHG Model AYE type or better heavy-duty feet with 3" adjustment. Stainless steel crossrails between all legs.
5. Provide splash to 7" at wall with 45° top angled back to wall and 1" turn down to wall.
6. Open below; provide open rail section with rear rail, per plan. 16 ga stainless steel under shelves per plans.
7. Field verify all dimensions prior to fabrication.
8. Provide shop drawing for review and approval prior to fabrication and installation.
9. Support channels below top and under shelf.

Item 36: Wall Shelf
Manufacturer: Stainless Steel Fabricator
Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. 16 ga stainless steel top and 14 ga stainless steel brackets.
2. Field verify all dimensions prior to fabrication.
3. Standard turn-down edge front and sides.
4. Two – tier 12" deep shelves.
5. Provide shop drawing for review and approval prior to fabrication and installation.

Item 37: Pot Washer, Door Type, High Temp
Manufacturer: Hobart
Model: PW10-1

Acceptable Alt: Stero, Champion or Equal (Must be Energy Star)

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Pot/Pan/Utensil Washer, front loading with split door design, (10) pan capacity, over/under rotating arms, 2/4/6 minute adjustable timer, up to (20) racks/hour, includes: (1) flat grid, (1) tray rack & (1) flat bottom rack, pre-rinse spray hose, sanitizing with Sense-A-Temp™ 70° booster rise, vent fan control, stainless steel construction, 208-240v/60/3-ph, cULus, BISSC Certified, NSF, ENERGY STAR® with Internal booster; 70 degree rise.
2. Drain tempering kit.
3. Heavy duty rolling rack.
4. Water hammer arrestor kit.
5. Steam pan rack, (5).
6. Seismic feet with holes (set of 4).
7. Provide with spray wand.

Item 38: Exhaust/Condensate Hood – 48" x 48"
Manufacturer: Streivor
Model: Type 2 CH Series

Acceptable Alt: Gaylord or Accurex

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Air volumes and overall dimensions per manufacturers shop drawings provided on sheet FS3.
2. Verify and coordinate access into building.
3. Provide trim and closure panels to ceiling.
4. Hood to be all welded, minimum 18 gauge stainless steel interior and exterior.
5. Verify hood height with ceiling obstructions and ductwork prior to submittal.
6. Length and width per plan(s); verify with clearances per UMC requirements.

7. Foodservice equipment contractor to provide shop drawings for hood and enclosure for re-view by consultant.
8. Hood hanging height to be minimum 6'-8" AFF to bottom edge.

Item 39: Closures and Trim
 Manufacturer: Stainless Steel Fabricator
 Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Provide trim and closure panels to ceiling and closures between and under hood #29; 18 ga type 304 stainless steel construction; no exposed fasteners.
2. No exposed fasteners.
3. Provide quantity required to extend entire length of hood sections.
4. Provide Closures to the finished ceiling; verify height.
5. Provide shop drawing for review and approval prior to fabrication and installation.

Item 40-41: Not Used

Item 42: Soiled Dishtable with Sink
 Manufacturer: Stainless Steel Fabricator
 Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Custom configuration per plans. Depth x length per plans and field conditions.
2. See elevation for details.
3. 14 gauge stainless steel top with integral rear backsplash, standard 3" rolled edge. Open storage and areas below per details.
4. (1) One 22"x 21"x15" deep sink compartments with removeable stainless steel cover. Slope drainboards to sink: provide removable scrap basket with guide rails.
5. Provide rail section with rear rail, per plan. 16 ga stainless steel under shelves per plans.
6. Sinks to include 12 gauge stainless steel lever waste brackets.
7. Provide splash to 9" at wall with 45° top angled back to wall and 1" turn down to wall. Pre-drill for faucets.
8. Legs to be 1 5/8" 16 Ga. stainless steel tubular type with CHG Model AYE type or better heavy-duty feet with 3" adjustment. Stainless steel crossrails between all legs.
9. Support channels below top.
10. Field verify all dimensions prior to fabrication.
11. Provide shop drawing for review and approval prior to fabrication and installation.
12. Provide with removable stainless-steel rack glides and one (1) removable perforated scrap basket.

Item 43: Not Used

Item 44: Pre-Rinse Faucet, Backsplash Mount
 Manufacturer: Fisher
 Model: 34460

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Pre-Rinse Unit, 8" OC backsplash mount, with spring action flexible gooseneck, wall bracket, Add-On-Faucet with 12" swing spout.

Item 45: Drain, Lever Handle
 Manufacturer: Fisher
 Model: 22209

Acceptable Alt: T&S Brass & Bronze Works or Component Hardware

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual teflon seals, stainless steel ball, cast red brass body.

Item 46: Sink, Hand, Wall Mount, ADA

Manufacturer: Advance Tabco

Model: 7-PS-25

Acceptable Alt: Eagle Metal Masters or Aero

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. ADA Compliant Hand Sink, wall mounted, 14" wide x 16" front-to-back x 5" deep bowl, 18 gauge 304 stainless steel, deck mounted faucet with wrist handles, deck mounted soap dispenser (pump), basket drain, wall brackets, NSF, cCSAus.
2. Paper Towel Dispenser, by School District.
3. P-trap, heavy duty, 1-1/2", 17 gauge.

Item 47: Faucet, Deck Mount

Manufacturer: Advance Tabco

Model: K-56-CA

Acceptable Alt: Eagle Metal Masters or Aero

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Faucet with Wrist Handles, deck-mounted, 4" O.C.
2. CA/VT no lead faucet upgrade, conforms to California AB 1953.
3. Low-flow aerator 0.5gpm, fits 55/64-27 female and 15/16-27 male thread, Conforms to California AB 1953.

Item 48: 3 Compartment Pot Wash Sink

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Custom configuration per plans. Depth x length per plans and field conditions.
2. See elevation for details.
3. 14 gauge stainless steel top with integral rear backsplash, standard 3" rolled edge. Open storage and areas below per details.
4. (3) three 15" deep sink compartments with removeable stainless steel cover. Slope drainboards to sink; tub sizes per plans.
5. Provide rail section with rear rail, per plan.
6. Sinks to include 12 gauge stainless steel lever waste brackets.
7. Provide splash to 7" at wall with 45° top angled back to wall and 1" turn down to wall. Pre-drill for faucets.
8. Legs to be 1 5/8" 16 Ga. stainless steel tubular type with CHG Model AYE type or better heavy-duty feet with 3" adjustment. Stainless steel crossrails between all legs.
9. Stainless steel finished front on sinks.
10. Support channels below top.
11. Field verify all dimensions prior to fabrication.
12. Provide shop drawing for review and approval prior to fabrication and installation.

Item 49: Pot Rack/Shelf

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. 16 ga stainless steel shelf and splash at back and sides, 14 ga stainless steel wall brackets.
2. Field verify all dimensions prior to fabrication provide wall to wall fit.
3. Provide with double sided sliding hooks (1) one every 6in. on center.
4. Flat stainless steel bar is 2in.x1/4in., sliding pot hooks all welded stainless – double sided 6in. O.C.
5. Provide shop drawing for review and approval prior to fabrication and installation.
6. 2 Sections, dimensions per plan.
7. With double sided pot hooks

Item 50-51: Not Used

Item 52: Drain, Lever Handle

Manufacturer: Fisher

Model: 22209

Acceptable Alt: T&S Brass & Bronze Works or Component Hardware

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual teflon seals, stainless steel ball, cast red brass body.

Item 53: Faucet, Backsplash Mount

Manufacturer: Fisher

Model: 60526

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Faucet, 8" backsplash mount, with 16" swing spout, elbows, stainless steel.

Item 54: Pre-Rinse Faucet, Backsplash Mount

Manufacturer: Fisher

Model: 99449

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Pre-Rinse Unit, 8" OC backsplash with elbows, with spring action flexible gooseneck, wall bracket, 3/4" faucet with 14" Add-On-Faucet.

Item 55: Mobile Table

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 – Products, Elevations, Details and the following:

1. Mobile table to be 2'-0" wide x 5'-0" long x 3'-0" high, as detailed.
2. Construction to be 14 gauge type 304 No. 4 finish stainless steel top, stainless steel legs, two (2) 16 gauge undershelves equally spaced – one (1) shelf fixed below 10" AFF and second shelf equal distance to top, per elevation details.
3. Four (4) 5" heavy duty swivel casters: Component Hardware #CMS4-5RBB, all with brake locks.
4. See FS series plans and elevations for details.
5. Field verify/coordinate all dimensions prior to fabrication.

Item 56: Electrical Cord Reel - Ceiling Hung

Manufacturer: By Electrical Contractor

Model: Not In Food Service Equipment Contract

Item 57: Prep Table with Sink

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. Custom configuration per plans. Depth x length per plans and field conditions.
2. See elevation for details.
3. 14 gauge stainless steel top. Open storage and areas below per details. Top to have straight turn-down edge.
4. Field verify all dimensions prior to fabrication.
5. Provide shop drawing for review and approval prior to fabrication and installation.
6. Support channels below top and under shelf.
7. (1) one 21"x 25"x15" deep sink compartment with removeable stainless steel cover. Slope drainboards to sink.
8. With drawers.
9. Legs to be 1 5/8" 16 Ga. stainless steel tubular type with CHG Model AYE type or better heavy-duty feet with 3" adjustment. Stainless steel crossrails between all legs per plans.

Item 58: Drain, Lever Handle

Manufacturer: Fisher

Model: 22209

Acceptable Alt: T&S Brass & Bronze Works or Component Hardware

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual teflon seals, stainless steel ball, cast red brass body.

Item 59: Faucet, Deck Mount

Manufacturer: Fisher

Model: 57657

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution, field verified conditions and the following:

1. Faucet, 8" deck mount, with 10" swing spout, lever handles, stainless steel, NSF.

Item 60-61: Not Used

Item 62: Double Over Shelf

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. 16 ga stainless steel tops, 1-5/8" dia. Stainless steel posts.
2. Field verify all dimensions prior to fabrication.
3. Standard turn-down edge all around.
4. Post mounted to/through table below.
5. Two – tier 24" deep shelves.
6. Provide shop drawing for review and approval prior to fabrication and installation.

Item 63: Storage Shelving

Manufacturer: Metro

Model: NK3 Series

Acceptable Alt: International Storage Systems (ISS), Amco Corp.

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Provide independent NK3 series 63" high posts for all units.
2. Provide each unit in length, width and configuration to fit per area as shown plans.
3. Each unit to contain 4 NK3 series shelves equally spaced with first shelf mounted 6" above finished floor.
4. Provide all components necessary for a complete and functional installation.
5. (4) Four Independent posts for each unit/assembly.
6. (4) Four 6" swivel caster's (2) two on long side with brakes.
7. 4-Tier; Mobile.

Item 64: Prep Table W/Sinks

Manufacturer: Stainless Steel Fabricator

Model: Custom

1. Fabricate and set in place per Part 2 Products, Elevations, Details and the following:
2. Custom configuration per plans. Depth x length per plans and field conditions.
3. See elevation for details.
4. 14 gauge stainless steel top. Open storage and areas below per details. Top to have straight turn-down edge. 16 ga stainless steel under shelves per plans.
5. Field verify all dimensions prior to fabrication.
6. Provide shop drawing for review and approval prior to fabrication and installation.
7. Support channels below top and under shelf.
8. (2) two 21"x 24"x15" deep sink compartment with removeable stainless steel cover. Slope drainboards to sink.

9. With drawers.
10. Legs to be 1 5/8" 16 Ga. stainless steel tubular type with CHG Model AYE type or better heavy-duty feet with 3" adjustment. Stainless steel crossrails between all legs per plans.

Item 65: Stainless Steel Wall Shelves

Manufacturer: Stainless Steel Fabricator

Model: Custom

Fabricate and set in place per Part 2 Products, Elevations, Details and the following:

1. 16 ga stainless steel top and 14 ga stainless steel brackets.
2. Field verify all dimensions prior to fabrication.
3. Standard turn-down edge front and sides.
4. Two – tier 12" deep shelves.
5. Provide shop drawing for review and approval prior to fabrication and installation.

Item 66: Drain, Lever Handle

Manufacturer: Fisher

Model: 22209

Acceptable Alt: T&S Brass & Bronze Works or Component Hardware

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual teflon seals, stainless steel ball, cast red brass body.

Item 67: Faucet, Backsplash Mount

Manufacturer: Fisher

Model: 60526

Acceptable Alt: T&S Brass Bronze Works or Chicago Faucets

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Faucet, 8" backsplash mount, with 16" swing spout, elbows, stainless steel.

Item 68: Filter System, Icemaker

Manufacturer: Manitowoc

Model: AR-20000

Acceptable Alt: Scotsman or Ice-O-Matic

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Arctic Pure® Primary Water Filter Assembly, includes head, shroud, hardware, mounting assembly, & (1) filter cartridge, 20,000 gallon capacity, 601-1,000 lbs./ice per day.
2. Provide (6) six additional replacement filters.

Item 69: Ice Maker with Bin

Manufacturer: Manitowoc

Model: IYT0420A / D-320

Acceptable Alt: Scotsman or Ice-O-Matic

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 - Execution and the following:

1. Indigo NXT™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 22"W x 24-1/2"D x 21-1/2"H, production capacity up to 460 lb/24 hours at 70°/50° (375 lb AHRI certified at 90°/70°), DuraTech™ exterior, half-dice size cubes, R410A, NSF, cULus, CE, ENERGY STAR®.
2. Stainless steel exterior.
3. Water filter specified as part of item #68.
4. Ice Bin, 22"W x 34"D x 38"H, with side-hinged front-opening door, side grips, AHRI certified 265 lb ice storage capacity (8.9 cu. ft.), for top-mounted ice maker, Duratech exterior, NSF.
5. Legs, 6", with adjustable secured flanged foot, stainless steel.

Item 70-71: Not Used

Item 72: Office Desk - With Drawers
Manufacturer: By Owner
Model: Not in Food Service Equipment Contract

Item 73: Cabinet, Heated, Roll Thru
Manufacturer: True
Model: STR2HRT-2S-2S

Acceptable Alt: Traulsen or Victory

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. SPEC SERIES® Heated Roll-thru,two-section, stainless steel front & sides, (2) stainless steel doors front & rear, locks, cam-lift hinges, color-coded temperature display, stainless steel interior, interior lighting, stainless steel ramps, 4000W, 115/208-240/60/1, NEMA 14-20P, [accommodates 27"Wx29"Dx66"H carts, NOT included], cULus, UL EPH Classified, MADE IN USA.
2. Seal ramps to floor.
3. Provide matching stainless steel closures to wall at top and sides. Seal to adjacent Roll-thru refrigerator, wall and floor.
4. Provide with door locks.

Item 74: Refrigerator - Roll Thru
Manufacturer: True
Model: STR2RRT-2S-2S

Acceptable Alt: Traulsen or Victory

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. SPEC SERIES® Roll-thru Refrigerator, stainless steel front & sides, (2) stainless steel doors front & rear, locks, cam-lift hinges, digital temperature control, stainless steel interior, incandescent interior lighting, stainless steel ramps, 1/2 HP, 115v/60/1, 9.5 amps, NEMA 5-15P, [accommodates 27"Wx29"Dx66"H carts, NOT included], cULus, UL EPH Classified, MADE IN USA.
2. Seal ramps to floor.
3. Provide matching stainless steel closures to wall at top and sides. Seal to adjacent Roll-thru heated cabinet, wall and floor.
4. Provide with door locks.

Item 75: Tray Shelf
Manufacturer: GA Systems
Model: TS1536

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Tray Shelf, drop-down design, 35"W x 15"D x 2"H, stainless steel construction, includes fold-down brackets; attached to/installed as part of item #76 – see plans.

Item 76: Hot Cabinet
Manufacturer: GA Systems
Model: H536

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Heated Serving Cabinet, 63-3/16"W x 36-3/8"D x 34"H, (2) sliding lids with locking bar, holds (12) 4" deep or (24) 2" deep baskets, stainless steel construction, includes: (2) locking pins, 3" plate casters with brakes, UL, UL EPH CLASSIFIED.
2. Top: 16 ga. 304 s/s #4 finish. Front and back edges turned down 102 degrees with 90 degree end flanges. Two staggered interior edges turned down 90 degrees to accommodate sliding lids. One locking pin located at each end to adjoin adjacent Speedee-Serv® cabinets. Pin also secures lids with the use of a 1" square s/s locking bar.

3. Body: Tubular frame design utilizing 1-1/2" sq. s/s tubing on four corners joined together with 1" sq. s/s tubing and 1" square hot rolled tubing. 20 ga. galvanized body trimmed with 22 ga. s/s to form front, back, and end panels.
4. 2700 watt thermostatically controlled convected air heating system. Front removable access panel 18 ga. 304 #4 s/s.
5. 120 Volt/60 Hz/Single Phase 30 Amp circuit. 6' cord with a Nema 5-30P plug requiring a Nema 5-30R receptacle. Actual amp draw 21 amps.
6. Casters: Plate type 3" swivel non-marking wheels with brakes all NSF.
7. Sliding lids: Lightweight aluminum honeycomb design with high pressure laminate on upper and lower surfaces. Trimmed with 20 ga. s/s 304 #4. Lids open and close with a sliding motion.
8. Provide with: 24—B13264/B13264S/B13264T and 48 —B13262/B13262S baskets.

Item 77: Hot Cabinet

Manufacturer: GA Systems

Model: H536

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Heated Serving Cabinet, 63-3/16"W x 36-3/8"D x 34"H, (2) sliding lids with locking bar, holds (12) 4" deep or (24) 2" deep baskets, stainless steel construction, includes: (2) locking pins, 3" plate casters with brakes, UL, UL EPH CLASSIFIED.
2. Top: 16 ga. 304 s/s #4 finish. Front and back edges turned down 102 degrees with 90 degree end flanges. Two staggered interior edges turned down 90 degrees to accommodate sliding lids. One locking pin located at each end to adjoin adjacent Speedee-Serv® cabinets. Pin also secures lids with the use of a 1" square s/s locking bar.
3. Body: Tubular frame design utilizing 1-1/2" sq. s/s tubing on four corners joined together with 1" sq. s/s tubing and 1" square hot rolled tubing. 20 ga. galvanized body trimmed with 22 ga. s/s to form front, back, and end panels.
4. 2700 watt thermostatically controlled convected air heating system. Front removable access panel 18 ga. 304 #4 s/s.
5. 120 Volt/60 Hz/Single Phase 30 Amp circuit. 6' cord with a Nema 5-30P plug requiring a Nema 5-30R receptacle. Actual amp draw 21 amps.
6. Casters: Plate type 3" swivel non-marking wheels with brakes all NSF.
7. Sliding lids: Lightweight aluminum honeycomb design with high pressure laminate on upper and lower surfaces. Trimmed with 20 ga. s/s 304 #4. Lids open and close with a sliding motion.
8. Provide with: 24—B13264/B13264S/B13264T and 48 —B13262/B13262S baskets.

Item 78: Cold Cabinet/With Display

Manufacturer: GA Systems

Model: C536/MD6336

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Refrigerated Serving Cabinet, 63-3/16"W x 36-3/8"D x 34"H, bottom-mounted self-contained refrigeration (Refrigerated Snap In), (2) aluminum sliding lids with locking bar, holds (6) 4" deep or (12) 2" deep baskets, removable louvered front access panel, hot gas condensate evaporator, includes (2) locking pins, stainless steel construction, 3" swivel casters with brakes, R134a, ADA Compliant, UL, UL EPH CLASSIFIED.
2. Merchandising Display Rack, 62"W x 32-1/2"D x 28-1/2"H, single tier, 1-1/2" square stainless steel tube construction, ETL.

Item 79: Cold Cabinet

Manufacturer: GA Systems

Model: C536

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Refrigerated Serving Cabinet, 63-3/16"W x 36-3/8"D x 34"H, bottom-mounted self-contained refrigeration (Refrigerated Snap In), (2) aluminum sliding lids with locking bar, holds (6) 4" deep or (12) 2" deep baskets, removable louvered front access panel, hot gas condensate evaporator, includes (2) locking pins, stainless steel construction, 3" swivel casters with brakes, R134a, ADA Compliant, UL, UL EPH CLASSIFIED.

Item 80-81: Not Used

Item 82: Staging Cabinet

Manufacturer: GA Systems

Model: D4836 - Custom

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Custom/modified cabinet – 32" long.
2. Mobile.

Item 83: Cashier Stand

Manufacturer: GA Systems

Model: D3136 - Custom

Acceptable Alt: No Known Equal

Furnish and set in place per manufacturer's standard specification, Part 1 – General Conditions, Part 2-Products, Part 3 – Execution and the following:

1. Custom/modified stand – 31" W x 48" L.
2. Mobile.

Item 84: Point Of Sale System

Manufacturer: By School District

Model: Not In Food Service Equipment Contract

Item 85-90: Not Used

END OF SECTION

12/04/18

SECTION 11 51 19

BOOK THEFT PROTECTION EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Library book theft protection equipment and accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for each item of security equipment. Show finishes, sizes, catalog numbers and pictures, instructions for installation and maintenance.
- B. Shop Drawings: Submit complete shop drawings, catalog cuts, and installation details, as appropriate, for all security equipment. Indicate dimensions, construction details, reinforcement, anchorage, and installation with relation to the building construction.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.3 INFORMATIONAL SUBMITTAL

- A. Qualification Data: For installer.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For book-theft detection equipment, to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer: Firm with minimum 5-year's successful experience installing library book security systems similar to application indicated and acceptable to system manufacturer.
- B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible; do not delay job progress; allow for trimming and fitting where necessary.
- C. Design Requirements: Design book security system to allow marking of library materials, processing marked items including checking in and out, and warning staff of unauthorized removal of library materials through exits.
- D. Regulatory Requirements:
 - 1. Provide security system meeting the requirements for the physically disabled of the 2016 California Building Code (CBC) Title 24 Part 2, and 2010 ADA Standards for Accessible Design.

2. Electrical components shall be labeled and listed by Underwriters' Laboratories or other testing agency acceptable to the State Fire Marshal.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver book security system components and accessories to Project site only after spaces to receive them have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturer, or equal:

bibliotheca + 3M; www.bibliotheca.com
Contact Representative:
Chase Humphrey
Customer Account Manager (EM)
e: c.humphrey@bibliotheca.com
t: +1-678-336-7980 ext 370

- B. Basis-of-Design System: bibliotheca + 3M; Tattle-Tape™ gate designed for use with Tattle-Tape™ Security Strips, is a versatile and compact solution for protecting the library from loss. It features a low frequency signal that minimizes interferences with surrounding electronic equipment.

- C. Benefits of the Tattle-Tape™ gate:

1. Reduce unwanted alarms: The Tattle-Tape™ gate can detect when an activated strip is leaving the library, significantly reducing false alarms at the gate when people enter. With multiple pedestals used to cover a larger entrance-way, the alarm lights on the gates also identify which aisle caused the alarm, helping staff locate items that triggered the alarm faster.
2. Integrated with libraryConnect™: Staff can remotely access libraryConnect™ for in-depth statistics and configuration options. This allows staff to remotely upgrade firmware, run monthly reports and change the alarm colors and patterns.
3. Genuine Tattle-Tape™ technology: With powerful algorithms, the genuine Tattle-Tape™ technology can distinguish between common metal items and any EM strip to yield the most accurate results. This means less false alarms and fewer inconveniences for both users and staff.
4. Superior detection of items in any orientation" Using the latest in DSP technology, the Tattle-Tape™ gate can detect EM strips regardless of the orientation within the gates, offering the highest level of detection, even in the noisiest of environments.
5. Integrated, visible people counter: The on-board bi-directional people counter accurately counts the number of people entering and leaving the library. This information is transferred to libraryConnect™ as well as the control box, which has a convenient display for quick access to live stats.
6. Selectable alarm color and pattern: Both visual and audible security alarm settings are completely configurable by the library. With 8 LED color alarms and patterns to choose from, the Tattle-Tape™ gate ensures both users and staff are alerted of items that have not been properly checked out.

7. Sleek design with interchangeable graphic sections: Tattle-Tape™ gate is designed to fit within new modern and updated library spaces. With easy-to-update panels, your security gates can match your library brand or promote an upcoming program.
8. Flexible configuration and installation: Simple set-up and maintenance allows our trained technicians to cause little disruption to your library and staff can quickly troubleshoot concerns with our dedicated phone support teams.

2.2 PRODUCT DESCRIPTION AND SPECIFICATIONS

- A. Lattice Dimensions in Inches (w x d x h): 2.5 (Max at base) x 23.5 x 70.3 (± 0.1).
- B. Weight (per gate): 80 lbs.
- C. Material: Pantone Cool Grey 4C HIPS.
- D. Power: A dedicated power line is recommended, but not required. The socket-outlet should be easily accessible and installed within 10 feet of the electronics enclosure.
 1. Supply voltage: 100/120; or 220/240 VAC, 50 / 60 Hz
 2. Power consumption: 3.0A @ 100/120 VAC; 1.5A @220/240 VAC.
- E. Data: Ethernet (TCP/IP).
- F. Performance:
 1. Optimized for detection of Tattle-Tape™ markers
 2. Optimal coverage is achieved within 39.4 inches of separation
- G. Alarm:
 1. Multi-color*, customer selectable LED lights. Colors as selected by Architect from manufacturer's standards.
 2. Variable alarm pattern and adjustable volume.
 3. Highly visible integrated digital display to monitor alarm counts, ingoing and outgoing patron traffic, and diagnostics.
- H. Standards compliance: CE, RCM, ETSI, FCC, IC, ADA, DDA, ETL and CSA.
- I. Temperature range:
 1. Operating: 50 deg F to 104 deg F.
 2. Humidity: 0% to 85% relative humidity, non-condensing.
- J. Configuration: 2 aisle standard configuration with 3 panels; and 1 aisle standard configuration with 2 panels, as shown on drawings.
- K. Detection Zone: The primary zone of detection between lattices extends 6 inches to 72 inches above the floor. Coverage is not 100%, but the rate of detection is effective the deter the loss of protected materials.
- L. Electronics Chassis: Each electronics chassis, which power and controls the system, can support a maximum of three lattices (two corridors).

2.3 ACCESSORIES

- A. bibliotheca Tattle-Tape™ Bookcheck: This unit saves time and space while helping to ensure reliable processing. It effectively desensitizes and resensitizes bibliotheca Tattle-tape Security Strips on print materials, CSs and DVDs. It also features an intuitive interface, ergonomic design and injection molded plastic for durability. UL-certified. Meets the WEEE and RoHS Directives.
- B. bibliotheca Tattle-Tape™ Desensitizer: This fast, efficient device adapts to virtually any checkout configuration and is ideal for high-volume checkout-only operations. It safely desensitizes bibliotheca Tattle-Tape Security Strips on print materials and CDs.
- C. Tattle-Tape Security Strips B1: Single-sided strips are designed for hardcover books. Strips can be easily inserted into book spines with a bayonet either on a countertop or right in the stacks. Strips are completely concealed.
- D. Tattle-Tape Security Strips B2: Ultra-thin double-sided strips are designed to be applied between pages of books and periodicals. The extra-long liner makes it easier to insert the strip deeply into the gutter, making it virtually undetectable.
- E. Tattle-Tape Security Strips DCD-2: These precision-balanced strips are designed for CDs and CD-ROMs. The easy, one-step application process integrates two strips into a clear film overlay that prevents removal and protects the surface of the disc. Strips will not affect performance.

2.4 FABRICATION

- A. Typical: Manufacturer's standard construction unless otherwise clearly indicated in Contract Documents.
- B. Fabricate gate components to support specified anticipated loads.
- C. Select materials for straightness, free of defects and irregularities.
- D. Make exposed joints flush butt type, hairline joints where mechanically fastened; provide concealed connection devices with hidden fasteners.
 - 1. Fabricate continuous items with joints neatly fitted and secured.
 - 2. Ease exposed edges to approximate 1/32-inch uniform radius.
 - 3. Remove sharp edges and corners.
- E. Exposed Mechanical Fastenings: Flush countersunk fasteners unobtrusively located, consistent with design of structure.
- F. Fit and shop assemble primary components in largest practical sections for site delivery.
- G. Separate dissimilar materials with bituminous paint where concealed, with preformed separators, or similar method to prevent corrosion.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Pre-Installation Site Survey: Engage manufacturer's representative to perform pre-installation site survey. Examine conditions for installation of library book security system in accordance with manufacturer's instructions.

- B. Where conditions may be problematic, provide temporary installation of system to determine operating environment is acceptable with no effect on system.

3.2 INSTALLATION

- A. Install library book theft protection equipment in accordance with manufacturer's recommendations, installation instructions, and approved shop drawings at location indicated on Drawings.
- B. Buried Cable Layout Requirements:
 - 1. The conduit used for cable routing in buried cable systems must meet the following requirements:
 - a. Minimum inside diameter of 1.00 inch.
 - b. Lattice to lattice conduit must not exceed 64 inches.
 - c. Conduit bend radius must be typical of electrical industry standards.
 - 2. Buried cable installation requirements for space and cabling: As shown in Tattle-Tape gate Pre-Installation Guide.
- C. Install fixed components plumb, true and in correct relation to adjacent work, free from distortion or defects detrimental to appearance and performance.
- D. Install accessory items in locations indicated, as directed by Owner where not otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field Tests: After modernization of building is complete and all library electrical components are operational, provide field tests in presence of Owner's personnel and IOR, including members of library staff.
 - 1. Test system to establish alarms operate properly with each type of media with pressure sensitive detection markers properly installed.
 - 2. Identify range extent of detection including potential "blind" spots in system.
 - 3. Test for potential "phantom alarms" due to wheelchairs, common types of card keys, keys, canes for visually impaired persons, and various types of umbrellas.
 - 4. Test each desensitizing unit and each resensitizing unit for proper operation.

3.4 ADJUSTING AND CLEANING

- A. Verify system operates correctly.
- B. Clean exposed surfaces and touch-up marred finishes or replace components as necessary to eliminate evidence of damage or deterioration.

3.5 MAINTENANCE

- A. Maintain book security system installation for 12 months after system is placed into operation.
- B. Include systematic examination and adjustment.

- C. Perform work without removing more than one unit from operation at a time.
- D. Provide maximum 8 working hour response time for emergency call-back service during maintenance period.
- E. Ensure competent personnel handle maintenance service.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain book theft protection equipment.

END OF SECTION

09/21/18

SECTION 11 51 23

LIBRARY STACK SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Designated steel library stack systems at Library B202.
- B. Products Installed But Not Furnished or Supplied Under This Section:
 - 1. Designated movable library bookshelf units (on casters) are Owner-Furnished, Contractor Installed.
- C. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- D. Related Sections:
 - 1. Section 01 11 00 "Summary of Work" for designated movable library bookshelf units (on casters) which are Owner-Furnished, Contractor-Installed.

1.2 REFERENCES

- A. The editions of specifications and standards referenced herein, published by the following organizations, apply to the construction only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American Institute of Steel Construction (AISC)
American Iron and Steel Institute (AISI)
American Society for Testing and Materials (ASTM International)
American Welding Society (AWS)
National Electrical Manufacturers Association (NEMA)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, color cards, and finishes for library stack systems and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Show clear-aisle widths from face of units.
 - 3. Detail fabrication and installation of library stack systems, including methods of anchoring them to building structure at locations recommended by manufacturer and as required for seismic restraint.
- C. Samples:

1. Plastic Laminate: Submit samples of each type of plastic laminate, including complete color and pattern range and surface finish.
 2. Paint Finish: Submit samples of paint finish to be used on metal surfaces.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Design Calculations: Submit structural calculations of seismic forces for fully loaded bookstacks demonstrating conformance with seismic design requirements. Calculations shall be titled as applicable for the specific units proposed, and for the specific project. Such a title shall be over-stamped by the Engineer's seal on the first sheet.
1. Framing system shall conform with seismic standards as outlined in 2016 CBC.
 2. Floor anchoring with trapezoidal gussets or any combination thereof, shall conform to 2016 CBC. Floor system to be compatible to account for such gravity and lateral loads. Similar for Partition walls used for connecting single faced shelving.
- B. Qualification Data: For Installer.
- C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For library stack systems to include in maintenance manuals.

1.6 QUALIFICATIONS

- A. Installer: Company specializing in Work of this Section with minimum five (5) years documented experience; manufacturer approved.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials only after exterior openings have been enclosed, wet work is complete, and proper facilities are available for handling, storing and protecting items.
- B. Deliver components in factory packages labeled to indicate contents.
- C. Store materials on clean concrete surface or raised platforms in safe, dry area, fully protected from weather.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Design and anchor shelving to resist lateral seismic forces as prescribed in ASCE 7-10, Section 13.3.1; equal to a minimum of 30-percent of the weight of rack plus contents, assumed to act at center of gravity, in the direction of each of the main axes of the shelving system.

1. Contents shall be assumed to weigh a minimum of 33 pounds per square foot of shelf.
2. A maximum of 90-percent of the weight of the rack plus contents shall be assumed to resist overturning moments.
3. Unbalanced loading shall be considered in the design.
4. Anchorages to the structure shall be with drilled-in anchors (Non-adhesive) with approved allowable capacities per ICC reports.
5. Drilled-in anchors shall be designed for combined shear and tension with appropriate conditions of concrete type, strength, and thickness and Special Inspection requirements.
6. Use of Special Inspection values for drilled-in anchors shall require field torque testing of anchors per ICC requirements.
7. Calculations prepared and signed by a Structural Engineer licensed in the State of California shall be submitted for review. Calculations shall indicate that the shelving complies with design criteria herein using design procedures of 2016 CBC as applicable code.
8. Architect shall furnish shelving contractor with pertinent structural criteria that includes the following before commencing design submittals: Seismic Zone, Seismic Fault Type, Soil Type, Na, Nv, Ca, Cv and Importance factor, concrete floor construction details and specifications, height above grade where shelving will be installed and height of the roof level above grade for the specific building.

2.2 MANUFACTURER

A. Acceptable manufacturer or equal:

Estey, a Division of Tennsco Corp; www.tennsco.com; Local Representative: The Ross McDonald Company, 925-455-1635.
 Montel Aetnastak Inc.; www.aetnastak.com
 Borroughs Wilsonstak; www.borroughs.com
 Library Bureau, Inc.; www.librarybureaushelving.com
 Republic Storage, Industrial Products Div.; www.republicstorage.com
 Substitutions: Section 01 25 13 – Product Options and Substitutions.

B. Basis-of-Design Manufacturer and Model: Estey, Cantilever Library Shelving.

2.3 MATERIALS

- A. Sheet Steel: ASTM A1008, cold-rolled sheet, commercial quality, Class 1, matte finish, stretcher-leveled.
- B. Plastic Laminate: NEMA LD-3, high-pressure type, Grade GP-50 (0.050-inch thick) plastic laminate, color and pattern as selected by the Architect from manufacturer's standards, laminated with moisture-resistant glue to core of plywood or particleboard.
- C. Fasteners: Cadmium-plated or zinc-plated steel, manufacturer's standard types and sizes.
- D. Sheet Steel Finish: Manufacturer's standard baked enamel finish; minimum of 1.0-mils dry film thickness. Provide custom colors as selected by the Architect.

2.4 FABRICATION

- A. Fabricate work in shop to greatest extent possible, before application of finishes. Remove sharp and rough edges and corners from cut metal and grind welds smooth. Design components, joints, and connections to withstand most severe possible loading condition, with normal safety factor.
- B. Configurations: Furnish and configure shelving units with shelves and accessories as shown on the drawings and/or scheduled herein.
 - 1. Configuration: Single-faced units as shown.

2.5 METAL BOOKSTACK UNITS

- A. Construction: Fabricate individual units with support provided by vertical columns slotted to receive cantilevered shelf brackets that are completely adjustable in 1-inch increments. Provide rigidity for free-standing ranges by manufacturer's standard welded construction; diagonal sway bracing not permitted.
- B. Standard Unit Sizes: Provide units of standard 36-inch nominal width, with other dimensions as follows:
 - 1. Shelf Depth: 10-inches nominal.
 - 2. Unit Heights: Provide units with following heights, complete with fixed bottom shelf, canopy top, and the following number of adjustable intermediate shelves per unit:
 - 90-inches high: 7 adjustable shelves per face, or as shown on drawings.
 - 42-inches high: 3 adjustable shelves per face, or as shown on drawings.
- C. Upright Posts: Manufacturer's standard tubular or back-to-back channel design; size, gage, and reinforcement as required for loading, but not less than 16-gage. Perforate each post full height on both faces with a row of slots spaced 1-inch on vertical centers to receive hooks and lugs of shelf brackets to provide 1-inch adjustment of shelves. Provide 2 uprights for each stack section of a range to provide modular shelving units.
- D. Bottom Spreaders: 16-gage minimum.
- E. Top Tie Channels: 16-gage minimum.
- F. Closed-Base Construction: Base brackets of 16-gage minimum for flanged construction, 13-gage minimum for plate-type construction, rounded or flared to match adjustable shelf brackets, with fixed shelf of minimum 19-gage, manufacturer's standard base closure system. Provide adjustable leveling device at each corner of unit with resilient pad, or metal glide for carpeted areas.
- G. Adjustable Bracketed Shelves: Design to support not less than 40-pounds per square foot, with 3/16-inch maximum deflection, but not less than 18-gage, with 3-bend edge construction designed to receive wire-type book supports. Fabricate brackets with rounded or flared ends and tops, 16-gage minimum, with integral post hooks near top of brackets and safety lugs near bottom.
- H. Divider Shelves: Fabricate of not less than 18-gage steel with front edge box formed and back edge formed with 5-inch high vertical return. Slot shelf 1-inch on center to receive divider plates. Provide 5 divider plates 6-inches high for each shelf.
- I. Periodical (hinged) display shelves: Shall consist of sloping display shelves hinged to adjustable shelf and base shelf brackets.

1. Display shelves shall have 14" actual height, and be hinged to allow a clear storage height of 6-1/4" between the opened display shelf and the storage shelf.
 2. Display portion to stay open without the aid of the user. Lower edge of display shelf shall have flange and turned up lip to provide a 1-3/8" clearance behind lip.
 3. Display shelves shall be supplied with rubber bumpers for sound deadening.
- J. Hinged Periodical Display Base Shelves: Same construction as hinged periodical display adjustable shelves, except construct storage portion similar to closed base shelf.
- K. End Panels: Plastic laminate panels in manufacturer's standard configuration, self edged.
1. Provide panels of full width and height of ranges to completely cover exposed ends of bookstack units.
 2. Provide end panel at each exposed end of each range.
 3. Color(s): As selected by Architect from manufacturer's full range.
- L. Canopy Tops: Plastic laminate panels in manufacturer's standard configuration, self edged.
1. Assemble tops in continuous lengths to completely cover the tops of bookstack units, including corners and ends.
 2. Where joints are required, they shall be splined and bolted to provide flush connections.
 3. Brace tops with 11-gage brackets designed to permit tops to support books and displays.
 4. Color: As selected by Architect from manufacturer's full range.

2.6 SHELVING ACCESSORIES

- A. Range Finders: Provide metal holders for 3" by 5" range finder cards on aisle-end of each range.
- B. Card Holders: Provide cast aluminum card holder for 3" by 5" card at aisle-end of each face, for mounting on end panel.
- C. Wire Book Supports: Provide 3/16" diameter wire-type book support for attachment to shelf above; tempered rod with cadmium, chromium, or nickel-plated finish. Provide 2 supports for every 3 shelves.
- D. Special Purpose Shelves: Provide the following shelf types at locations indicated.
1. Magazine display shelf (sloped).
 2. Paperback/microfilm/cassette/tape shelf.
 3. Sliding Reference Shelf. Sturdy full extension slides attach to underside of adjustable self.

2.7 STEEL FINISHES

- A. Prepare component parts for painting by a multi-stage cleaning and phosphatizing process.
- B. Finish material with a powder paint baking enamel of a medium gloss, applied by electrostatic method, capable of withstanding severe hammer and bending tests without flaking. Liquid applied baked enamel is not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Take field measurements; report variance between plan and field dimensions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor over which shelving is to be installed.
- B. Before installing veneer-faced panels, condition materials to average prevailing humidity in installation areas for a minimum of 48 hours.

3.3 INSTALLATION

- A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
- B. Install units at locations indicated, in continuous ranges made up of number of units indicated, complying with manufacturer's instructions. Set units plumb and level, using adjustable leveling devices.
- C. Install end panels and canopy tops with concealed fasteners.
- D. Install types of shelves at locations and spacing indicated or, if not indicated, at equal spacing in each unit.
- E. Install accessory items in locations directed.

3.4 ANCHORAGE

- A. Bookstack Anchorage: Install bookstacks using floor anchors, wall anchors, or top bracing in locations recommended by manufacturer and as indicated on Shop Drawings.
- B. Anchor and brace single-faced ranges over 42-inches high to wall construction in accordance with 2016 California Building Code (CBC), Title 24 Part 2.
- C. Assemble bracing system as necessary for stability, extending and fastening frame members to supporting structure. Use concealed fasteners; securely attach units to bases or supporting frames. Set screws to penetrate not less than 1 inch into 2 inch nominal blocking or framing at walls.

3.5 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protect installed products from damage during remainder of the construction period.

END OF SECTION

04/01/19

SECTION 11 52 00

AUDIO-VISUAL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Audio-visual equipment.
- B. Products Installed But Not Furnished or Supplied Under This Section:
 - 1. Ceiling mounted projectors are Owner-Furnished, Contractor Installed.
- C. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- D. Related Sections:
 - 1. Section 11 52 13 – Projection Screens.
 - 2. Division 27 – Communications.

1.2 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's catalog cuts, specifications and installation instructions for each type of audio-visual equipment. Include wiring diagrams for electrically-operated units.
- B. Shop Drawings: Submit shop drawings showing dimensions and details of mounting for each type of audio-visual equipment, and location of wiring connections.
 - 1. Shop drawings shall indicate all grounds, backing, blocking, sleepers and other items required for the installation of equipment that is to be furnished and installed as part of the structure. Provide necessary templates.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver equipment until the building is enclosed and ready for equipment installation. Protect equipment from damage during delivery, storage, handling and installation.

1.4 WARRANTY

- A. Section 01 78 36 – Warranties: Requirements for warranties.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:

1. Audix; www.audixusa.com
2. Dukane; www.dukaneav.com
3. Eiki; www.eiki.com
4. Epson; www.epson.com
5. K-Array; www.k-array.com
6. Chief Manufacturing; www.legrandav.com
7. Da-Lite; www.legrandav.com
8. Extron; www.extron.com
9. Mackie; www.mackie.com
10. Midas; www.midasprosound.com
11. Peerless Industries; www.peerless-av.com
12. Shure; www.shure.com
13. Soundcraft; www.soundcraft.com
14. Substitutions: Section 01 25 13 – Product Options and Substitutions.

2.2 CEILING-MOUNT PROJECTORS (Owner-Furnished, Contractor Installed)

A. Eiki EK820U Laser Projector:

1. 10,000 lumens bright and a 100,000:1 contrast ratio.
2. Lampless Laser Technology.
3. Cabinet Dimensions - excluding legs: 7.1 x 19.0 x 20.0 in. (HxWxD).
4. Weight (without lens) 52.9 lb.
5. Power Requirements 100-240V AC, 50/60 Hz.

B. Epson Powerlite 990 Projector:

1. Projection System: 3LCD, 3-chip technology.
2. Projection Method: Front/ ceiling mount.
3. Weight: 7.05 lbs.
4. Dimensions, excluding feet: 12.1" x 11.5" x 3.5" (W x D x H).
5. Power Supply Voltage: 100 – 240VAC ±10%, 50 / 60Hz AC.

C. Epson Powerlite 685 W WXGA 3LCD Presentation Display:

1. Projection System: 3LCD, 3-chip technology.
2. Projection Method: Front / Rear / Wall Mount / Table.
3. Weight: 1.26 lbs.
4. Dimensions, excluding feet: 14.5" x 15.8" x 5.9" (W x D x H).
5. Power Supply Voltage: 100 – 240VAC ±10%, 50 / 60Hz AC.

2.3 PRECONFIGURED KIT OF PROJECTOR CEILING MOUNT PRODUCTS

A. Basis-of-Design Product: Chief Manufacturing, KITES003 which includes (1) Model RPAMU Universal Projector Mount; (1) CMS003 Extension Column; and (1) CMS440 Lightweight Suspended Ceiling Kit.

B. Model RPAMU Universal Projector Mount:

1. Specifications:
 - a. Adjustments: Roll: 3°, Pitch: 20°, Yaw: 360°
 - b. Certifications: TÜV Certified, UL Listed.
 - c. Color: Black.
 - d. Extension: 3.0"
 - e. Shipping Weight: 16 lbs.
 - f. Solution Type: Universal.

- g. Weight Capacity: 50 lbs.
- C. Model CMS003 Extension Column:
- 1. Features:
 - a. Aluminum extension column features easy installation and maximum strength.
 - b. Consists of 1.5" NPT column, threaded on both ends.
 - c. Use in combination with any Chief 1.5" NPT ceiling plate or other accessory.
 - d. TAA Compliant.
 - 2. Specifications:
 - a. Certifications: TÜV Certified, UL Listed, TAA Compliant.
 - b. Color: Black.
 - c. Extension 3 inches.
 - d. Overall Dimensions (H x W x D): 3.0" x 1.9" x 1.9."
 - e. Shipping Weight: 1 lbs.
- D. CMS440 Lightweight Suspended Ceiling Kit:
- 1. Features:
 - a. WireVice Cable Suspension System for quick and easy tie-off
 - b. TwisTile Ceiling Tile Cutter easily pierces a circular hole in the ceiling tile for extension column
 - c. Flexible solution provides infinite column placement within a 2' x 2' or 2' x 4' ceiling tile
 - d. Single and dual electrical outlet cutouts
 - e. All-Points Security System provides exclusive locking hardware at column connection point to protect against theft
 - f. Includes (4) 25' flexible cables, (4) wood eyebolts, (4) concrete anchors and a chrome trim ring
 - g. Fits 24" (600 mm) wide ceiling tile grids
 - h. 1.5" NPT compatible.
 - 2. Specifications:
 - a. Certifications: TÜV Certified, UL Listed.
 - b. Color: White.
 - c. Overall Dimensions (H x W x D): 1.3" x 8.0" x 23.4."
 - d. Shipping Weight: 8 lbs.
 - e. Weight Capacity: 50 lbs.

2.4 SOUND SYSTEMS

- A. K-Array Pinnacle-KR202 I: The Pinnacle-KR202 I is an ultra-light powered system in a stereo configuration. Each side features 1 x Thunder-KMT18 I subwoofer with 2 channels of 1000W matched to 2 x Kobra-KK102 I mid-high line array elements with 16 x 2" neodymium magnetic transducers each. The hardware included guarantees ultra fast set-up and optimum mechanical stability. The Pinnacle-KR202 is ideal for applications such as fitness and wellness and event productions, such as weddings, fashion shows and corporate events.
- 1. K-Array Pinnacle-KR202-I: The KR systems are integrated, self-powered speaker systems, featuring mid-hi line array elements matched to powered subwoofers. All systems feature two channels of Class D amplification housed in the subwoofer. The rear panel provides input for 2 balanced line signals and a digital signal in AES/EBU protocol. And with the K-dante accessory, the system can be used in a Dante

network. An integrated touch screen provides intuitive managing and editing of powerful DSP controlling: Input and output levels, In/ Out routing, subwoofer delay up to 12 ms, Speakon output to the mid-hi element with delay up to 12 ms, and overall system delay up to 330 ms. All DSP functions, including EQ can be controlled with remote managing software via USB or RS485, again, conveniently on a standard XLR. The unique four-corner port configuration gives symmetrical back loading to the sub speaker for extended bass response with very low distortion.

2. This also gives incredible structural strength to the cabinet despite its light weight. Pocket handles in the sub and an M20 thread mount position for attaching mid-high speakers, with a variety of mounting and rigging hardware options make the systems very versatile in almost any application and in every type of venue. KR102 features a pair of KMT12 (12") subs each with 2 channels of 1,000 W matched to a Kobra loudspeaker with 16 x 2" neodymium speaker elements. The KR102 system is designed by the K-array R&D department and custom made under the K-array quality control system.

3. Thunder-MKT18 I:

- a. Acoustics:
 - 1) Power handling: 800 W.
 - 2) Impedance: 8 Ω .
 - 3) Frequency Range: 30 Hz - 150 Hz \pm 3dB (preset relating)
 - 4) Maximum SPL 130 dB continuous - 136 dB peak.
- b. Coverage:
 - 1) Horizontal: Omni.
 - 2) Vertical: Omni.
- c. Crossover:
 - 1) Type: DSP controlled.
 - 2) Frequency: 150 Hz (preset dependent).
- d. Transducers:
 - 1) Full-range: 1 x 18" Neodymium speakers with 3" voice coil.
- e. Amplifiers:
 - 1) Type 1 modules class D - DSP controlled.
 - 2) Power 2x1000 Watt @ 8 Ω .
 - 3) Protection: Dynamic limiter, over current, over temp, short circuits.
- f. Physical Overview:
 - 1) Dimensions: 18.3" W x 18.3" H x 23.46" D.
 - 2) Weight: 60.84 lb.

4. Kobra-KK102 I:

- a. Acoustics:
 - 1) Power handling: 800 W.
 - 2) Impedance: 8 Ω or 32 Ω (selectable).
 - 3) Frequency Range: 150 Hz - 20 H
 - 4) Maximum SPL: 124 dB continuous - 130 dB peak.
- b. Coverage:
 - 1) Horizontal: 110 degrees.
 - 2) Vertical: 10 degrees – 35 degrees (selectable).
- c. Crossover:
 - 1) Type: External Crossover required.
 - 2) Frequency: High pass @150 Hz, 24 dB/oct suggested minimum.
- d. Transducers:
 - 1) Full-range: 16 x 2" Neodymium magnet with 0.75" voice coil.
- g. Power Audio Inputs:
 - 1) Connectors: 2 x 4-pin Speakon.
 - 2) Wiring: 1+ 1- (signal IN & LINK); 2+ 2- (through).
- h. Physical Overview:

- 1) Dimensions: 2.93" W x 39.37" H x 3.18" D.
- 2) Weight: 10.58 lb.

B. Dukane Sound Collar – WMIC2B Wireless Mic/Speaker System:

1. The WMIC2B consists of a small light-weight transmitter with an attachable mic. The transmitter sends the digitized voice signal via 2.5 GHz to a receiver inside the pole mounted speaker unit. The receiver converts the signal to audio and feeds a 30 W amplifier connected to the speakers. This results in a voice/sound reinforcement system.
2. An added Aux Input permits a second audio channel to be included. The unit has 4 modes of operation; Mic only, Mic and Aux mixed, Mic priority, and Aux priority. An optional adapter permits obtaining the speaker audio signal for recording.
3. Features:
 - e. Lightweight transmitter on lanyard with volume adjust.
 - f. Range of 80 feet without being blocked using RF at 2.4GHz (same as WiFi).
 - g. Will automatically select any of 20 separate channels.
 - h. Comes complete with lapel mic, transmitter, and speaker unit.
 - i. Uses a rechargeable Li battery for 8 plus hours of operation.
 - j. Speaker unit can be easily attached to projector pole mount.
 - k. New model WMIC2B has a 30 watt output and 4 selectable modes for the audio output priority.
4. Physical Properties:
 - a. Dimensions: 254 x 250 x 80 mm.
 - b. Weight: 3.3 lbs.
 - c. Power Supply: DC12V/2A (Power adapter).
 - d. Safety: CE, FCC, BSMI, CCC.

2.5 WALL INPUTS

A. Extron WPB109:

1. Mounting: Surface mount, Extron EWB or SMB 110 Series.
2. Enclosure type: Metal.
3. Connector type:
 - a. 1 female HDMI to 1 female HDMI on a pigtail cable.
 - b. 1 female VGA to 1 female VGA on a pigtail cable.
 - c. 1 female 3.5 mm stereo audio jack to captive screw connector.
4. Resolution range: HDMI cable: Up to 4K @ 60 Hz (4096x2160) or UHD @ 60 Hz (3840x2160) 8 bit color depth, max.; 18.0 Gbps data rate.
5. Enclosure dimensions:
 - a. Faceplate: 4.5" H x 2.8" W x 1.6" D (1 gang).
 - b. Enclosure/connectors: Allow 2.25" depth for cable management.
6. Product weight: 0.2 lb.
7. Vibration: ISTA 1A in carton (International Safe Transit Association)
8. Regulatory compliance: Environmental: Complies with the appropriate requirements of RoHS, WEEE.
9. Warranty: 3 years parts and labor.

B. Accessories: Furnish with Extron Cable Install Kits.

2.6 DIGITAL MIXER

A. Midas M32 Digital Mixer:

1. Type: Digital
2. Channels: 40

3. Inputs - Mic Preamps: 32 x XLR
4. Phantom Power: 32
5. Inputs - Other: 6 x 1/4" (aux in), 2 x RCA (left, right aux in)
6. Outputs - Main: 2 x XLR (monitor out), 2 x 1/4" (monitor out), 1 x XLR (AES/EBU out), 2 x XLR (main stereo bus)
7. Outputs - Direct: 16 x XLR (assignable)
8. Outputs - Other: 6 x 1/4" (aux out), 2 x RCA (left, right aux out)
9. Inputs - Digital: 96 x AES50
10. Outputs - Digital: 96 x AES50 (dual AES50 Ethernet jacks)
11. Aux Sends: 16
12. Busses/Groups: 16
13. Channel Inserts: Internal
14. Talkback: Yes
15. MIDI I/O: In/Out
16. Data I/O: Ethernet, USB, Ultranet, MIDI
17. USB: 1 x USB Type A, 1 x USB Type B
18. Computer Connectivity: USB (32 x 32), Ethernet
19. I/O Expansion Slots: Expansion card interface
20. Headphones: 2 x 1/4" TRS
21. Faders: 25 x 100mm motorized faders
22. EQ Bands: 4-band parametric (inputs), 6-band (buses)
23. Effects: 8 stereo/16 mono effects, 60 effect presets
24. Transport Controls: Yes
25. DAW Control: Yes
26. Height: 10.1"
27. Depth: 23.9"
28. Width: 35.1"
29. Weight: 53.9 lbs.
30. Manufacturer Part Number: M32IP.

2.7 STAGE BOXES (AUDIO INPUTS)

- A. Midas DL16: The Midas DL16 is a 16-in/8-out stage box that includes 16 fully programmable and remotely controllable Midas mic preamps, which are the same preamps found in the larger PRO Series consoles, and are equipped with switchable +48V phantom power. Additionally, the DL16 features 8 electronically balanced low impedance line level outputs, as all of the DL16's inputs and outputs have been designed to handle both balanced and unbalanced signals, removing any worries about signal degradation, noise, and crosstalk interference. The DL16 also features dual Cirrus Logic Digital to Analog converters, providing a reduced noise floor and lower distortion, and post-DAC filtering to remove wide-band noise.
- B. Front Panel Connections:
 1. Microphone Inputs: 16 XLR male 3-pin, Neutrik + 48 V phantom powered.
 2. Outputs (Analog): 8 XLR female 3-pin, Neutrik Dual ADAT.
 3. Preamps: 16 Midas PRO.
 4. MIDI I/O: For directional communication.
 5. Monitoring: Ultranet personal monitoring system.
 6. Headphones: 1 x 1/4" / 6.3 mm TRS.
 7. Network: AES ports with Klark Teknik SuperMAC technology.
 8. Network Cables: CAT5/5e for up to 328 feet.
 9. Power Supply: Auto-ranging universal switch-mode power supply.

2.8 WIRELESS MICROPHONES

- A. Shure QLX-D - Features:

1. Transparent 24-bit digital audio captures every performance detail.
2. Over 120 dB of dynamic range eliminates transmitter gain adjustments.
3. Easy pairing of transmitters and receivers over IR scan and sync.
4. Automatic channel scan quickly and easily finds a clean frequency.
5. Networked channel scan configures open frequencies for connected receivers.
6. Remote monitoring and control from iOS devices via ShurePlus™ Channel Mobile App.
7. AES-256 encryption comes standard for secure wireless transmission.
8. Elegant and easy-to-use interface with high-contrast LCD menu.
9. AMX/Crestron control system ready.
10. Professional-grade, all metal construction.

2.9 ANTENNAE DISTRIBUTION

- A. Shure UA844+SWB: The Shure Model UA844+SWB is an antenna distribution system that allows for the expansion of wireless microphone systems by splitting one pair of antennas to multiple receivers. It also amplifies RF signals to compensate for insertion loss that results from splitting signal power to multiple outputs. A single UA844+SWB system can support up to five wireless receivers. A maximum of five UA844+SWB systems may be used in a two-tiered configuration.
- B. Features:
 1. Five-way RF signal output.
 2. Support QLX-D®, ULX®, ULX-D®, SLX®, and BLX® (BLX4R only) receivers.
 3. Front-mounting antenna hardware.
 4. Rack-mounting hardware.
 5. 4 DC power feeds and for receivers (15V, 2.5A max).
 6. DC outputs for antenna bias (12V, 300mA max).
- C. UA844+SWB models include:
 1. 1 UA844+SWB Antenna/Power Distribution System.
 2. 1 PS60 power supply.
 3. 4 Locking DC power cables (for ULX4D, ULXP4).
 4. 4 Non-locking DC power cables (for QLXD4, SLX4, BLX4R).
 5. Ten 22 in. BNC cables.
 6. Two 6 ft. BNC cables.
 7. 2 Bulkhead adaptors.
 8. 1 Rack mount Hardware kit.
 9. 1 Literature Package.

2.10 MONITOR AND VOLUME CONTROL

- A. Mackie SRM150: The SRM150 combines Mackie's proven mixer and SRM Series Active Loudspeaker technologies to create a powerful, great-sounding 3-channel PA system that is ultra-compact, versatile, and expandable.
- B. The built-in Mackie mixer provides two mic/line channels that accept XLR or 1/4-inch connectors, with switchable 48V phantom power on the mic inputs. Channel 1 can also accept an instrument input directly from a guitar or bass with the press of a switch. A third stereo channel can be used for playing back MP3s, CDs, or tapes. A 3-band EQ is including to adjust the tone and minimize feedback, and a Thru connector provides a line-level output for connecting to a mixer or another powered loudspeaker.
- C. Features:

1. Extremely portable powered loudspeaker system.
2. Built-in Mackie mixer with superior sound quality with:
 - a. 3-channel mixer with 3-band active EQ.
 - b. Two high-headroom Mackie mic/line preamps with 48V phantom power.
 - c. Instrument-ready input (no DI required).
 - d. Dedicated stereo channel for keyboards, CD, MP3, etc.
 - e. Combo "line-in" for linking or adding inputs.
 - f. XLR "thru" with mic/line switch for linking more SRM150s or direct send to PA.
3. 150W Peak of high output, Class D power.
4. 5.25" premium quality, full-range neodymium driver.
5. Frequency response: 100 Hz to 17.5 k.Hz.
6. 120 dB maximum SPL peak @ 1 meter.
7. Complete system protection with built-in limiter.
8. Built-in carry handle on top.
9. Integral aluminum heatsink.
10. Mic stand integration system for use with stand and boom.
11. Tough, impact-resistant polypropylene enclosure.
12. Lightweight for ultimate portability (7.6 lb.)

2.11 OVERHEAD MIC FOR RECORDING

- A. Audix 1255B Overhead: The black M1255B Miniature Condenser Microphone from Audix measures 2.1" in length, features a cardioid polar pattern, and contains an integrated preamplifier. It offers a sensitive capsule and a wide frequency response suitable for capturing both vocals and instruments. Additionally, a high output enables long cable runs for use with group vocal capturing, stage performances, and similar scenarios. There is an included detachable 25-foot cable with mini XLR-female and standard XLR-male connections. The cardioid polar pattern provides adequate off-axis signal and feedback rejection while providing a generous pickup area at the front of the capsule. The microphone can be used in a wide variety of applications, including choir capturing, overhead cymbals, speech, ambient room capturing, and percussion. A microphone stand adapter, hanging clip, and external foam windscreen are also included.
- B. Analog Performance:
 1. Transducer: Condenser.
 2. Diaphragm: 0.47" / 12 mm.
 3. Polar Pattern: Cardioid.
 4. Frequency Range: 50 Hz to 19 kHz.
 5. Signal to Noise Ratio: 73 dB A-Weighted.
 6. Equivalent Noise Level: 21 dB A-Weighted.
 7. Maximum SPL: 130 dB SPL.
 8. THD: 0.5%.
 9. Impedance: 150 Ohms.
 10. Sensitivity: 38 mV/Pa at 1 kHz.
 11. Dynamic Range: 109 dB.
- C. General:
 1. Output Connectors: 1 x 3-Pin XLR.
 2. Operating Voltage: 18 to 52 V.
 3. Length: 2.13".
 4. Weight: 0.56 oz.

2.12 RECORDING BOARD

- A. Soundcraft Signature 12MTK: The Soundcraft Signature 12MTK incorporates Soundcraft's iconic Ghost mic preamps, directly drawn from the company's top-of-the-line professional consoles, to deliver extraordinary audio quality with high headroom, wide dynamic range and exceptional resolution and clarity with a superb signal to noise ratio. They employ Soundcraft's Sapphyre Assymetric EQ for perfectly equalizing every vocal and instrumental element in a mix with the unmistakable musicality inherent in every Soundcraft console, plus the GB Series audio routing technology famous in thousands of live venues worldwide.
- B. The Soundcraft Signature 12MTK includes a wide variety of built-in Lexicon studio-grade reverb, chorus, modulation and other effects and dbx limiters on the input channels. In addition, the console's multi-track USB audio interface allows any VST/AU/AAX/TDM/RTAS plug-ins to be inserted on any input channel, enabling studio plug-ins to be seamlessly integrated with live performances. Accompanying the consoles are free downloads of the Lexicon MPXL native plug-in and Ableton Live 9 Lite.
- C. The console is designed to deliver pristine recordings. Both have an ultra-low-latency USB interface that flawlessly captures every channel, which can then be mixed or transferred to a DAW for further mixdown and production. The consoles offer XLR and switchable Hi-Z inputs that enable guitars, basses and other instruments to be directly connected.
- D. The Soundcraft Signature 12MTK features smooth, premium-quality faders with GB® Series audio routing with flexible pre/post switching on each Aux, and subgroups with powerful routing and switching options as well as dedicated outputs.
- E. The Soundcraft Signature 12MTK is built using tour-grade robust metal construction and top-quality components. It has an internal universal power supply.
- F. Features:
 - 1. High-Performance 12-input small format analogue mixer with onboard effects and multi-track USB recording and playback.
 - 2. 14-in/12-out ultra-low latency USB playback and recording interface.*
 - 3. Iconic Soundcraft® Ghost mic preamps with ultra-low noise performance.
 - 4. Renowned Soundcraft® Sapphyre British EQ with sweepable mid-bands per channel.
 - 5. Lexicon® Effects Engine featuring award-winning Reverbs, Delays, Choruses and Modulations.
 - 6. dbx® Limiters (High-ratio Compressors) on input channels.
 - 7. Switchable Hi-Z inputs for guitars, basses and other instruments.
 - 8. Hi-Pass Filters (low-cut) and 48V Phantom Power on all mic channels.
 - 9. Comprehensive Soundcraft® GB series audio routing with Auxes (flexible pre/post switching) and subgroups with switching and dedicated outputs.
 - 10. Smooth premium-quality faders.
 - 11. Robust metal construction for tour-grade build quality and reliability.
 - 12. Internal universal power supply.
 - 13. USB Interface Compatibility:
 - a. PC: Supports Windows 7, Windows 8 and Windows 10.
 - b. Mac: Supports Mac OS 10.7.x Lion through 10.11.x El Capitan.
- G. Physical Properties:
 - 1. Height: 4.4 inches.
 - 2. Width: 15.0 inches.
 - 3. Length: 15.3 inches.
 - 4. Weight: 12.9 lbs.

2.13 DUAL-USE PROJECTION SCREENS AND MARKER BOARDS

- A. Da-Lite IDEA Projection Screen: The Interactive Dry Erase Application (IDEA) Screen surface to consist of a proprietary projection surface permanently bonded to a magnetic substrate that allows use of dry erase markers, interactive stylus and touch interactivity. Projection surface to have a gain of 2.5 and a viewing half angle of 25 degrees. Frame will be 1" thick with a 3/8" bezel in aluminum with a silver finish. Bezel thickness at the screen surface is 0.06". IDEA Screens include top mounting brackets, lower mounting brackets, 24" length marker tray, a set of three dry erase markers, foam eraser, cleaning cloth and cleaning solution.
- B. Manufacturer: Milestone AV Technologies LLC.
- C. Description: Interactive Dry Erase Application (IDEA) Screen:
 - 1. 16:10 Wide Format for B206 Career Center:
 - a. Size (Height x Width): Viewing Area 46 x 73-1/2 inches, Nominal Diagonal 87 inches, Overall Frame Dimensions 46-3/4 x 74-1/4 inches.
 - b. Frame Finish: Silver.
 - 2. 16:10 Wide Format for B203 Computer Lab and B204 Student Project & Production Space:
 - a. Size (Height x Width): Viewing Area 50 x 80 inches, Nominal Diagonal 94 inches, Overall Frame Dimensions 50-3/4 x 80-3/4 inches.
 - b. Frame Finish: Silver.
- D. Materials:
 - 1. Board: Write/erase projection film.
 - 2. Frame: Aluminum with anodic finish.
 - 3. Marker Package: One set of markers, one cleaning cloth and spray cleaner for each unit.
 - 4. Mounting Bracket: Manufacturer's standard wall bracket(s) for each.
 - 5. Marker Tray: Aluminum with finish to match frame and screws for field attachment. Width: Full Screen Width.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install audio visual equipment and supports in accordance with the drawings, the manufacturer's printed instructions, and to suit the conditions. Proper backing shall be provided for all items.
- B. Inserts, anchors and required devices shall be furnished and installed.

END OF SECTION

03/28/19

SECTION 11 52 13
PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Electrically operated, large venue, front-projection screens and controls.
 - 2. Electrically operated, front-projection screens and controls.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 05 50 00 – Metal Fabrications: Metal support framing for front-projection screens.
 - 2. Division 26 – Electrical: Power supply, conduit, and wiring.

1.2 DEFINITIONS

- A. Gain: Indication of screen's luminance or brightness, measured perpendicular to screen center and relative to magnesium carbonate block, which serves as standard for 1.0 gain. Higher numbers indicate greater brightness.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.
- C. Viewing Angle: Horizontal angle from perpendicular center of screen at which gain or brightness decreases by 50%.
- D. Format: Proportion of projection screen viewing area expressed as a ratio of width/height.
 - 1. HDTV Format: 16:9.
 - 2. 16:10 Wide: 1.60:1

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

- Aluminum Association (AA)
 - American Society for Testing and Materials (ASTM International)
 - Society of Motion Picture and Television Engineers (SMPTE):
 - 1. SMPTE RP 94-2000, Gain Determination of Front Projection Screens.
 - Underwriters Laboratories Inc. (UL)

1.4 ACTION SUBMITTALS

- A. Product Data: Submit copies of manufacturer's catalog cuts, specifications and installation instructions for each type of projection screen. Include wiring diagrams for electrically-operated units.
- B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
 - 1. Drop lengths.
 - 2. Location of seams in viewing surfaces.
 - 3. Anchorage details, including connection to supporting structure for suspended units.
 - 4. Details of juncture of exposed surfaces with adjacent finishes.
 - 5. Location of wiring connections for electrically operated units.
 - 6. Wiring diagrams for electrically operated units.
 - 7. Accessories.
- C. Samples: Submit 2 samples of screen finish material having dimensions of 6 inches x 6 inches.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's installation instructions.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit for products in accordance with Section 01 78 23. Include:
 - 1. Manufacturer's instructions detailing maintenance requirements.
 - 2. Parts catalog that includes complete list of repair and replacement parts, with cuts and identifying numbers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install front-projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

- A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.9 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

- C. Warranty: Commencing on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELECTRICALLY OPERATED PROJECTION SCREENS

- A. General: Provide recessed, electrically operated projection screens. Sizes as indicated. Acceptable manufacturers/products or equal:

Da-Lite Screen Company Inc.; www.da-lite.com
Draper Shade & Screen Co., Inc.; www.draperinc.com
Bretford Manufacturing Co.; www.bretford.com

- B. Basis of Design Product (large venue projection screens): Da-Lite Screen Company Inc.; Model: Tensioned Professional Electrol®. Model 99932.
- C. Basis of Design Product (large venue tensioned projection screens): Da Lite Screen Company Inc.; Model: Large Tensioned Advantage Deluxe Electrol®. Model 70068.

2.2 ELECTRICALLY OPERATED PROJECTION SCREEN – LARGE VENUE

- A. Type 2: Tensioned System.

1. Screen Operation: Electrically operated, UL listed, retractable, heavy duty, with rigid metal roller and motor housed within the roller. Tab guide cable tensioning system to maintain even, lateral tension and hold viewing surface flat. Bottom end of fabric to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface.
 - a. Motor: Single motor, UL and ULC certified, 3-wire permanently lubricated reversal-type, attached to header, with preset adjustable limit switches to automatically stop viewing surface in UP or DOWN position. Includes automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting.
 - 1) Voltage, Frequency: 115 V, 60 Hz.
 - 2) Amperage: 2.4 amps.
 - 3) Limit Switches: Preset and adjustable to automatically stop viewing surface in UP or DOWN position.
 - 4) Housing: Inside metal roller.
2. Screen Mounting:
 - a. Student Commons B102: Steel beam mounted as detailed.
 - b. Black Box B125: Wall-mounted.
3. Screen Case: Designed to receive mounting hardware and sized to suit projection screen.
 - a. Material: Wood with double top member for rigidity.
 - b. Case Finish: Prime painted black.
4. Screen Size:
 - a. Student Commons B102: Viewing Area: 92 inches High x 164 inches Wide.
 - b. Black Box B125: Viewing Area: 121 inches High x 216 inches Wide.
5. Basis-of-Design Product: Da-Lite Screen Company, Inc., Tensioned Professional Electrol® Projection Screen.
6. Screen Material:

- a. Front projection, flame retardant, mildew-resistant seamless vinyl, black backed, with standard black borders, easily cleaned with mild soap and water solution.
 - b. Gain: To SMPTE RP 94-2000, 1.0.
 - c. Half Gain Angle: 60 degrees.
 - d. HDTV Format: 16:9.
 - e. Acceptable Viewing Surface: Da-Lite Screen Company, Inc.: Da-Mat.
7. Accessories:
- a. Extra Screen Drop Length: As needed at top of screen for bottom of screen to be 36 inches above floor.
 - b. Single Motor Low Voltage Control: External.
 - c. Wireless Remote Control for LVC: 3-button handheld remote control for UP, DOWN and STOP functions with single motor, low voltage control unit.
 - 1) Type: Infrared.

2.3 ELECTRICALLY OPERATED PROJECTION SCREEN – LARGE VENUE TENSIONED

A. Type 2: Tensioned System.

1. Screen Operation: Electrically operated, UL listed, retractable, heavy duty, with rigid metal roller and motor housed within the roller. Tab guide cable tensioning system to maintain even, lateral tension and hold viewing surface flat. Bottom end of fabric to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface.
 - d. Motor:
 - 1) 2 UL Certified, 120 V, 60 Hz, 3-wire permanently lubricated reversal-type, attached to header.
 - 2) Amperage: Not more than 2.4 amps.
 - 3) Include automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting.
 - 4) Preset, adjustable limit switches to automatically stop viewing surface in UP or DOWN position.
2. Screen Mounting:
 - a. Drama B126: Suspended ceiling recessed.
 - b. Music B128: Gypsum board ceiling recessed.
 - c. Library B202: Steel beam mounted as detailed.
 - d. Student Lounge B205: Gypsum board ceiling recessed.
 - e. Staff Lounge / Development B207: Gypsum board ceiling recessed.
3. Screen Case: Extruded aluminum with self-trimming flange. Case is designed to receive mounting hardware and is sized to suit projection screen.
 - a. Case Finish:
 - 1) Drama B126: Powder coated white.
 - 2) Music B128: Powder coated white.
 - 3) Library B202: Powder coated black.
 - 4) Student Lounge B205: Powder coated white.
 - 5) Staff Lounge / Development B207: Powder coated white.
 - b. Case Closure Door: Include automatically operated, hinged powder coated aluminum finish screen closure door on case bottom.
 - c. Case Access Door: Hinged, powder coated aluminum finish screen access door on case bottom for maintenance access.
4. Screen Size:
 - a. Drama B126: Viewing Area: H 108 inches × W 192 inches.
 - b. Music B128: Viewing Area: H 108 inches × W 192 inches.

- c. Library B202: Viewing Area: 108 inches High x 192 inches Wide.
 - d. Student Lounge B205: Viewing Area: H 108 inches x W 192 inches.
 - e. Staff Lounge / Development B207: Viewing Area: H 108 inches x W 192 inches.
5. Acceptable Material: Da-Lite Screen Company, Inc., Large Tensioned Advantage Deluxe Electrol projection screen system.
- a. Screen Viewing Surface:
 - 1) Front projection, flame retardant, mildew-resistant seamless vinyl, black backed, with standard black borders, easily cleaned with mild soap and water solution.
 - 2) Gain: To SMPTE RP 94-2000; 1.0.
 - 3) Half Gain Angle: 60 degrees.
 - 4) Format: HDTV Format: (16:9).
 - b. Acceptable Materials: Da-Lite Screen Company, Inc.:
 - 1) Da-Mat viewing surface with GREENGUARD Certification #90068-9.
6. Accessories:
- a. Extra Screen Drop Length: As needed at top of screen for bottom of screen to be 36 inches above floor]
 - b. Key Locking Cover Plate: Hinged cover plate with brushed stainless steel finish provides keyed access to low voltage control wall switch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:

- 1. Verify that conditions of substrates previously installed under other sections are acceptable with electrically operated and manually operated projection screen installation.
- 2. For ceiling recessed screens, ensure secondary framing support has been installed in accordance with Section 05 12 00 – Structural Steel Framing.
- 3. Ensure electrical power supply is installed to meet electric projection screen requirements in accordance with Division 26.
 - a. Verify type and location of power supply.
- 4. Inform Architect of unacceptable conditions immediately upon discovery.
- 5. Proceed with installation only after unacceptable conditions have been corrected.

3.2 COORDINATION

- A. Coordinate projection screen placement with other ceiling- and wall-mounted components.

3.3 INSTALLATION

- A. Install electric projection screens in accordance with the drawings, the manufacturer's directions and instructions, and to suit the conditions. Proper backing shall be provided for all items.
- B. Inserts, anchors and required devices shall be furnished and installed.

- C. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
 - 1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

3.4 PROTECTION

- A. Provide protection for installed screens so that they will be in satisfactory operating condition, without damage, at completion of the project. Repair or replace damaged units as directed by the Architect.
- B. Installation shall be made without damage to the surfaces to which the items are attached. After completion of the installation, accessories and surfaces shall be cleaned and left in perfect condition.

END OF SECTION

03/29/19

SECTION 11 61 23

PLATFORMS AND SEATING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Provide audience risers, guardrails and peripheral accessories required for flexible, modular audience seating platforms in Blackbox Theater B125. Provide rolling storage carts for audience risers, guardrails and peripheral accessories.
- B. Provide portable audience seating for risers in Blackbox Theater B125. Provide rolling storage racks for all seating.

1.3 REFERENCES

- A. All audience risers and seating shall meet standard practices recognized by:
 - 1. National Fire Protection Association (NFPA).
 - 2. United States Institute for Theatre Technology (USITT).
 - 3. Professional Lighting and Sound Association (PLASA).
- B. American Hardboard Association (AHA):
 - 1. AHA A135.4-95: Basic Hardboard.
- C. APA – The Engineered Wood Association:
 - 1. Performance Standards and Policies for Structural Use Panels.
- D. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- E. Architectural Woodwork Institute (AWI):
 - 1. Quality Manual, Current Edition.
- F. ASTM International (ASTM):
 - 1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 3. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 - 4. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low Alloy With Improved Formability, and Ultra High Strength.
 - 5. ASTM B85 - Standard Specification for Aluminum Alloy Die Castings.
 - 6. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 7. ASTM B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 8. ASTM B429 - Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 - 9. ASTM C423 - Standard Test Method for Sound Absorption and Sound

- 10. Absorption Coefficients by the Reverberation Room Method.
ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- 11. ASTM E 413 - Classification for Rating Sound Transmission.
- G. International Building Code (IBC).
- H. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual for Architectural and Metal Products.
- I. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA LD 3-2000 - High Pressure Decorative Laminates.
- J. U.S. Department of Commerce, National Institute of Standards and Technology:
 - 1. DOC PS 1: U.S. Product Standard for Construction and Industrial Plywood.

1.4 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Provide test results by certified independent testing laboratory indicating compliance with performance requirements.
 - 2. Rated capacities, construction details, material descriptions, dimensions of individual components, profiles, and finishes.
 - 3. Delivery, storage, handling, and installation instructions and recommendations.
 - 4. Maintenance instructions and recommendations.
- B. Shop Drawings:
 - 1. Submit component and project specific installation drawings, cut sheets, and schedules showing all information necessary to fully explain the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation. Submit for approval before beginning any fabrication, installation, or erection.
 - 2. A copy of the Bill of Material shall be included with the submission for approval.
 - 3. Include fabrication and installation details. Distinguish between factory and field work.
 - 4. Include plans, elevations, sections, attachments and work by other trades.
 - 5. Indicate seismic bracing and fastening requirements as applicable.
- C. Product Schedule:
 - 1. Use designations indicated on the Drawings.
 - 2. Include room locations, dimensions, accessories, finishes, and project specific notes.
- D. Samples: Submit five 12" square samples of upholstery fabric in color selected by Architect.
- E. All submittals shall comply with procedures outlined in Section 01 33 00 Submittals.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For adjusting, repairing and replacing components and accessories.
 - 1. Provide two copies of complete inventory of all audience risers, guardrails, peripheral accessories, riser wagons, audience seating and audience seating storage racks with quantity and description of each item.

- B. Warranty: Submit manufacturer's warranty.

1.6 SUBSTITUTIONS

- A. Provide full and complete documentation for any substitutions indicating exactly how said substitutions meet and equal the specific products contained herein these specifications. There shall be no variance provided for substitutions failing to meet specifications. Substitutions shall require three (3) sets of revised materials list, manufacturer's cut sheets, complete specifications and other related written materials to support the substitutions as "equal" products.
- B. The entire cost of all changes due to substitution of products for those listed in this specification shall be born by the Contractor at no extra charge to the District.
- C. Unsolicited and voluntary deducts on the part of the Contractor for submitting unapproved equipment shall not be considered for purposes of awarding the contract.
- D. Contractor shall accept the amount of the cost credit to the Contract in the event the proposed substitution is accepted.
- E. All substitutions shall comply with Section 01 25 13 – Product Options and Substitutions, requirements and include Section 01 25 13 Substitution Request Form.

1.7 AVAILABILITY OF SPECIFIED MATERIAL

- A. Verify prior to bidding that all products specified herein are available and can be provided to the District in a timely manner prior to conclusion of project.
- B. In the event the specified items will not be so available, notify the District prior to the receipt of bids.
- C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by proper investigation on the part of the Contractor, shall be back charged as necessary and shall not be bound by the District.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain all products from a single manufacturer through one source providing a comprehensive material and installation package:
- B. Manufacturer Qualifications: Minimum 5 years' experience in manufacture of similar products in use in similar environments, including project size, and complexity, and with the production capacity to meet the construction and installation schedule.
- C. Installer Qualifications: Experienced in installation of the work of this section and acceptable to the manufacturer.
- D. Regulatory Requirements: Where components are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".
- E. All products shall have a minimum five-year warranty covering replacement of any units that fail and all parts that malfunction due to normal use.

- F. Seating shall meet ANSI /BIFMA x 5.1 – 2002 and ASTM F851-87 (2013) – Standard Test Method for Self-Rising Seat Mechanism Standards.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original unopened containers with manufacturer's labels attached. Do not deliver material until spaces to receive them are clean, dry, and ready for their installation. Ship to jobsite only after roughing-in, painting and other finishing work has been completed, installation areas are ready to accept work.
- B. Handle and install materials to avoid damage.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install materials until spaces are enclosed and weather tight, wet work in spaces is complete and dry, HVAC system is operating and maintaining ambient temperature at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Five-year warranty for Platforms.
- B. Five-year warranty for Portable Audience Chairs.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide a complete, integrated audience riser system that is portable and modular to allow a number of different audience configurations within the Blackbox Theater to include: Thrust, arena, end stage, tennis court among other seating layouts. The audience riser system shall be manufactured by Wenger Corporation, JR Clancy and GearBoss., www.wengercorp.com; or equal, and include the following components as described in Article 2.2 and Article 2.3

2.2 PLATFORMS

- A. Basis of Design: StageTek™ Platforms; portable stage platforms and seated risers as manufactured by Wenger Corporation.
- B. Structural Performance Requirements:
 - 1. Stage Platforms and Risers: Standard Uniform Load 4 feet by 8 feet Deck: 125 lbf/ft. Heavy-Duty Uniform Load 4 feet by 8 feet Deck with additional 5th leg: 200 lbf/ft.
 - 2. Stage Platforms and Risers: Dynamic Live Load: Side load of 15 percent of total Uniform Live Load: 600 lb side load on a 4 feet by 8 feet platform under a total Uniform Live Load of 4,000 lbs.
 - 3. Stage Platforms and Risers: Point Load: 1,500lb applied via 1 inch diameter pin.
 - 4. Stage Platforms and Risers: Fully replaceable components including corners, frame and wood deck. Replaceable in the field with common tools.
 - 5. Treads of Stairs: Uniform Load: 500 lbs per 36 inches x 11 inches tread, and concentrated load: 300 lbs on area of 12 sq. in. Total Uniform Load of 1,000

- lbs per stair assembly.
 - 6. Guard Rail Concentrated Load: 200 lbf applied at any point in any direction.
 - 7. Guard Rail Uniform Load: 50 lbf/ft. applied to top rail.
 - 8. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 lbf applied to 1 sq. ft. area.
 - 9. Guard Rail In-Fill Panel compliant with IBC 4 inches sphere code.
- C. Materials:
- 1. Aluminum: Complies with ASTM Standards listed above in paragraph 1.3.F above.
 - 2. Materials Meeting Sustainable Design Requirements:
 - a. Provide stage platforms and risers made with products and adhesives that contain no urea formaldehyde.
 - 3. Softwood Plywood: DOC APA PS1.
 - 4. Hardboard: AHA A135.4, Tempered Grade.
 - 5. Hardware and Fasteners: Manufacturer's standard non-corroding type, permanently mounted to units, remaining set or tightened under load and vibration in service, and designed to preclude user contact with sharp edges.
- D. Frame: Extruded 6063-T6 aluminum, 4 inches tall, with hidden contours to accept attachments. Rounded 1.5 inches hand-hold area open to accept power-grip (closed-grip) around entire perimeter. Frame components are repairable and replaceable.
- E. Corners: Cast 380 aluminum corner assembly engages leg 3 inches and secures leg with a full-length 2.75 inches convex brace driven by a threaded bolt operated with a nylon t-handle. Corner assemblies are repairable and replaceable.
- F. Legs: Legs operate individually and are constructed of extruded 6063-T6 aluminum round tube, 2.50 inches diameter with a wall thickness of 0.075 inch. Provide with telescoping legs, as required for layout indicated. Non-marking cap. Legs to store resting on frame rails or in clamping brackets within deck frames.
- 1. Telescoping Legs: Provide for all platforms. Standard Telescoping Legs available in configurations adjusting between 8 inches to 28 inches. Nominal height adjustment in increments of 4 inches secured with spring-loaded quick-release pin. Constructed of extruded 6063-T6 aluminum round outer tube, 2.50 by 0.075 inch telescoping over a 2 inches by 0.125 inch inner tube. With an adjustable threaded foot providing for fine adjustability between beyond nominal set length of leg. The foot shall provide a non-marking rubber pad. Inner and outer Tubes secured with non-rattling bushings and shall not pull apart from each other.
- G. Deck Panels: Manufacturer's standard panel construction, 3/4-inch overall thickness, consisting of minimum 1/2-inch thick plywood substrate with finish surfaces consisting of, edged with extruded aluminum:
- 1. Finish: Manufacturer's standard carpet, with plywood bottom.
 - 2. Panel Dimensions: Manufacturer's standard sizes, as required for layout indicated.
- H. Guards and Railings: Complying with performance requirements, clamp-attached without tools, lower horizontal rail acts as chair stop. Furnish with infill panels to bring Guard Rails into compliance with International Building Code specifying that a 4 inches sphere object cannot pass through the railing.
- 1. Quantity: Provide nine (9) 8'-0" long "StageTek" guardrails 42" height; and Sixteen (16) 3'0" long "Stage Tek" guardrails 42" height.
 - a. Each guardrail shall comply with IBC code requirements for loading, feature two (2) uprights and two (2) crossbars with infill panels, with black powder-coat paint finish.
- I. Box Step: Single relocatable box step equipped with clamps for fixing in place, height as required, located as indicated.

- J. Leg Storage Clips: Provide bottom-of-deck panel leg storage clips.
- K. Chair Stops: Clamp on leg stop, able to be installed and demounted without tools constructed of tube steel. Semi-permanent Chair Stop constructed of extruded PVC and secured into deck with screws.
- L. Storage Cart: Wenger Universal Deck and Rail Cart. Steel tube-framed, folding transport cart with heavy-duty, non-marring locking 8 inch casters, and ratcheting nylon safety strap.
 - 1. Provide quantity of ten (10) carts.
 - 2. Cart designed to carry up to 6 StageTek rectangular decks or 6 StageTek guardrails.
 - 3. Combinations of decks and guardrails can be stored on same cart.
- M. Closure Panels: Closure panels matching Standard textured horizontal surface, not less than 3/4 inch thick plywood, secured with tool-free snap attachment located as follows:
 - 1. Front of unit.
 - 2. Sides of unit.
 - 3. Intermediate risers.
- N. Metal Finishes: Aluminum: Mill finish.
- O. Opaque Finish for Hardboard: 100 percent acrylic paint, specially formulated for adhesion to impermeable surfaces, 1-coat, satin finish, black.
- P. Fabrication: Provide portable stages and risers meeting performance requirements, with the following characteristics:
 - 1. Portable and storable in space indicated.
 - 2. Easily set up and disassembled without use of special tools or loose fasteners.
 - 3. Modular and reconfigurable.
 - 4. Platform components replaceable with common tools to include corners, frame sections, and platform decking.
 - 5. Platforms supported by individual legs that are storable inside the platform frame.
 - 6. Platforms designed for comfortable and secure power-grip (closed-grip) anywhere around entire deck perimeter.
 - 7. Lightweight leg sets/understructures - 40 inches tall or shorter weigh less than 10 lbs.
- Q. Platform Quantity: Provide the following quantities:
 - 1. Twenty-five (25) "StageTek" decks 3'-0" x 8'-0".
 - 2. Six (6) "StageTek" decks 3'-0" x 3'-0".

2.3 SEATING

- A. Basis-of-Design Product: Wenger Portable Audience Chair – Standard Model.
 - 1. Single Chair, Item 027A101. Weight: 35 lbs.
 - 2. Freestanding, folding, audience seating chair with built-in ganging device.
 - 3. Steel chair frame is constructed with 16 gauge continuous electric welded 1" x 2" rectangular steel tube.
 - 4. Frame is finished with a durable black powder coat.
 - 5. Portable Audience Chair has yellow birch hardwood arm rest in black lacquer finish with rounded corners for a stylish appearance.
 - 6. The chair folds for storage and transport on the accessory cart.
 - 7. Seat and back are upholstered with durable 100% Polypropylene fabric (Sherpa and Shire Marquesa® Lana). Available in standard Absecon Mills, Sherpa and Shire fabrics. Fabric as selected by Architect.

8. Seat cushion is 2-1/2" thick, high-resiliency polyurethane foam with a 5 ply-3/8" contoured hardwood plywood substrate.
 9. Back cushion is 1-1/2" thick, high-resiliency polyurethane foam with a 5 ply-3/8" contoured hardwood plywood substrate.
 10. Back cushion is shaped to provide lumbar support for long-term comfort.
 11. Chair seat is spring-loaded and returns to a folded position when not occupied.
 12. Overall chair height is 32" with a seat height of 17-1/2". Chair depth (back of chair to front edge of seat in the "down" position) is 26".
 13. When the seat automatically returns to the "up" position, the chair depth is 20".
 14. Provide in 21" seat width.
 15. ANSI/BIFMA x 5.1-2002.
 16. ASTM F851-87 (2000).
 17. Furnish quantity of 120 portable audience chairs.
- B. Two (2) chairs shall be designated aisle seats with retractable or folding arm rests and identified with an ISA symbol, per 2016 CBC 11B-221. One chair shall have a left-hand retractable or folding arm rest. One chair shall have a right-hand retractable or folding arm rest.
- C. Storage/Transport Cart:
1. Wenger Corp.; Model 027A036; Weight: 150 lbs.
 2. Rack, move, and store up to 24 Wenger portable audience seating chairs.
 3. Steel construction with easy-roll casters.
 4. Overall cart dimensions: 72" high x 82" wide x 42" deep.
 6. Overall cart dimensions with stored chairs: 81" high x 82" wide x 42" deep.
 7. Five-year warranty.
 8. Assembly required.
 9. Furnish quantity of five (5) storage/transport carts.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Project conditions must be completely clean, clear, free of dust and debris prior to delivery of audience risers and chairs to Blackbox Theater. This shall include all floor surfaces and walls being finished and painted prior to delivery of products.
- B. Provide for protection of products and coordinate with all trades to ensure no damage to these products.
- C. Initial setup of audience risers and seating shall be the responsibility of District in coordination with school staff. Theatre faculty will determine initial seating configuration in collaboration with Architect.

3.2 DISCREPANCIES

- A. In the event of a discrepancy, immediately notify Architect.
- B. Do not proceed with delivery of audience risers and /or seating products to Blackbox Theater until all such discrepancies have been fully resolved.

END OF SECTION

08/27/18

SECTION 11 61 43

STAGE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Provide theater curtains and curtain tracks at the following locations:
 - 1. Blackbox Theater B125.
- B. Stage Curtains shall refer to all fabric soft goods used in the Blackbox Theater spaces in support of the performers.

1.3 REFERENCES

- A. All stage curtains shall meet standard practices recognized by:
 - 1. ASTM International (ASTM).
 - 2. National Fire Protection Association (NFPA).
 - 3. United States Institute for Theatre Technology (USITT).

1.4 ACTION SUBMITTALS

- A. Contractor agrees that shop drawings submittals processed by the District do not become contract documents and are not change orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the District to monitor the Contractor's progress and understanding of the design. If deviations, discrepancies or conflicts between shop drawings submittals are processed by the District, the Contractor agrees that the Contract Documents shall control and shall be followed.
- B. Shop Drawings: Provide four (4) sets of B size drawings for approval within two – six (2-6) weeks of Notice to Proceed by District.
 - 1. Include plans, elevations and detailed sections of typical rigging elements and curtain layout. Show anchors, hardware, operating equipment, and other components required.
- C. Product Data: Submit four (4) CD's with all product cut sheets and full bill of materials in electronic format. Submit manufacturer's specifications, installation instructions and general recommendations, including data substantiating that materials comply with requirements.
- D. Samples: Submit 2 each 12-inch square samples of each of the specified fabrics and color(s) required.

- E. Identify each item by manufacturer, fabricator, brand and trade name, size, rating and whatever other data is necessary to properly identify and check the materials.
- F. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 CLOSEOUT SUBMITTALS

- A. Provide hard copies of complete inventory of all stage curtains installed that state the exact location where curtains have been installed.
- B. Provide two (2) copies of complete inventory of all stage curtains that were not installed and remain in storage bags.
- C. Distribution:
 - 1. Two (2) copies of each document to District Facilities Office to District Construction manager.
 - 2. One (1) copies of each document to Architect.

1.6 RECORD DRAWINGS

- A. Provide "As built" drawings in the form of red markups on one set of hard copy, full size, black line drawings.
- B. Deliver two completed sets of Record Drawings to the District.

1.7 SUBSTITUTIONS

- A. Provide full and complete documentation for any substitutions indicating exactly how said substitutions meet and equal the specific products contained herein these specifications. There shall be no variance provided for substitutions failing to meet specifications. Substitutions shall require four (4) sets of revised materials list, manufacturer's cut sheets, complete specifications and other relate written materials to support request for substitution/s as "equal" product/s.
- B. The entire cost of all changes due to substitution for materials or equipment specified shall be born by the Contractor at no extra charge to the district.
- C. Unsolicited and voluntary deducts, on the part of the Contractor for submitting unapproved systems and/or equipment, shall not be considered for the purpose of awarding the contract.
- D. The Contractor shall accept the amount of the cost credit to the Contract in the event the proposed substitution is accepted.

1.8 AVAILABILITY OF SPECIFIED MATERIAL

- A. Verify prior to bidding that all specified material is available and can be obtained in time for installation during orderly and timely progress of the work.
- B. In the event that specified items will not be so available, notify the District prior to receipt of bids.

- C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by proper investigation on the part of the Contractor, will be back-charged as necessary and shall not be bound by the District.

1.9 QUALITY ASSURANCE

- A. Project Conditions: Examine all attachment areas and conditions under which the stage curtains are to be installed. Work shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.
- B. Fabricator/Installer Qualifications: Firm with 10 years experience in producing stage curtains similar to those indicated for this Project that have a record of successful in-service performance, and with sufficient production capacity to produce required units without causing a delay in the Work.
- C. Flame Resistance: Stage curtains shall be certified to be flame resistant per NFPA 701, Reg. No. A-358. Permanently attach label to drapery indicating that unit is inherently and permanently flame resistant (immersion method), or whether it will require retreatment after dry cleaning.
- D. Regulatory Requirements: Curtains shall meet the requirements of the California Fire Code (CFC) Title 19, Section 807.1.2, Section 807.2, Section 308, Article 3-08 and IBC Standard 4-1.
- E. Stage drapes and curtains shall be approved by the California State Fire Marshall and meet the flame propagation criteria of NFPA 701. Curtains shall be labeled as required by CCR T-19, Div 1, Section 1324. A Certificate of Flame Retardancy shall be provided to the District for each curtain panel, and a copy shall be included in the "Maintenance Manual" compiled by the Stage Rigging installer.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver track or curtains until building is enclosed and ready for their installation. Protect from damage during delivery, handling and site storage.

PART 2 – PRODUCTS

2.1 CURTAIN TRACK

- A. ACCEPTABLE MANUFACTURERS
 - 1. H & H Specialties Inc., South El Monte, California.
 - 2. J. R. Clancy, Syracuse, New York.
 - 3. ADC, Allentown, PA.
 - 4. Light Source, Charlotte, N.C.
 - 5. Chicago Hardware, Ill.
 - 6. UniStrut.
- B. Basis-of-Design Product for Blackbox Theater: H&H Specialties Inc., Model 228B.

1. Track shall be 16 gauge galvanized steel, roll-formed to 1-3/4" wide X 2" high with continuous slot in bottom.
2. Provide unspliced in lengths up to 24'.
3. Suspend track with two-piece clamp hanger formed from 11 gauge steel. Install end stop with cord support at each track end. Where lengths exceed 24', connect tracks with 12" long, two-piece splicing clamp of 12 gauge steel.
4. Provide single carriers, spaced on 9" centers, constructed of two urethane-tired wheels fastened parallel to shielded ball bearing carrier body and supplied with heavy-duty hook, swivel eye and trim chain for attachment of curtain. Black Super Tough nylon shall be molded around shielded and greased ball bearing to form carrier body. Install round neoprene bumper between each carrier on operating line to reduce noise.
5. Master carriers shall be 4-wheel assemblies with bodies formed from 11 gauge steel with press-fit shielded ball bearings. Connect to operating line with two formed steel cord clamps attached to each body. Supply each master carrier with two heavy-duty hooks, swivel eyes and trim chains for attachment of leading edge of curtain.
6. Single and double end pulleys shall clamp securely to the underside of the track channel and shall contain 4" diameter sheaves enclosed in steel housings to prevent operating line from escaping the grooves. Sheaves shall be Nylatron GS molded around shielded and greased ball bearings and grooved to accommodate up to 3/8" operating line.
7. Provide floor block in 12 gauge steel housing containing 4" Nylatron GS shielded ball bearing sheave. Sheave axle shall lock at any point within 9" vertical slots to allow tension adjustment of operating line.
8. Black operating line shall be 3/8" diameter, stretch-resistant rope with spun polyester outer jacket braided over Dyneema core.
9. Track shall be finished with a semi-gloss black powder coat. All other steel components shall be black oxide finished.

2.2 STAGE CURTAINS

- A. General: Provide fabrics inherently or permanently flame resistant or chemically flame resistant by immersion treatment to comply with requirements specified. Provide fabrics from the same dye lot.
- B. Fabric:
 1. 20 oz Inherently Flame Retardant Crescent velour.
 2. 24 oz Flame Retardant Memorable Cotton Velour.
 3. Inherently Flame Retardant Poly Cyc.
 4. Colors specified by manufacturer shown in the drawings shall govern. If the Contractor wishes to substitute for the manufacturer's color already specifically called out in the drawings, the substitution is subject to rejection if it does not match the required condition, per the Architect's judgment. In the event the Architect rejects it, the specified color and the manufacturer called out in the color legend shall be provided.

5. Fabric selections, color, dimensions, finishes, and hanging location are specified in the Curtain Matrix on the drawing.

C. Acceptable fabricators:

Rose Brand Fabrics: www.rosebrand.com

I Weiss Theatrical Solutions: www.iweiss.com

Texas Scenic, San Antonio, TX www.texasscenic.com

2.3 FABRICATION

A. Curtains Fabrication:

1. Curtain fabric shall be of first grade quality with no runs or flaws and all from same dye lot.
1. No horizontal seaming will be allowed.
2. All vertical seams shall be straight and securely sewn.
3. Added fullness, when specified, shall be uniformly spaced box pleats 12" on center.
4. When raw fabric widths are other than 54", an exception can be made for box pleats on 9" centers.
5. Pinch pleats, Knife pleats, Lapped Pleats and Shirring are unacceptable.
6. Curtain material shall be sewn with the appropriate weight cotton/polyester thread with a safety overlock stitch.
7. Curtain material shall be sewn to a 3-1/2" wide polyester webbing at the top with two continuous, parallel, and straight sets of stitches, with at least 1" of the face fabric turned under, unless otherwise noted. On shorter or light weight goods, lighter weight webbing may be substituted.
8. Bottom hems shall be not less than 6".
9. All velours shall be fabricated with the nap up.
10. Except for side seams, all vertical seams shall be hidden within the box pleats.
11. Side seams shall be at least 2".
12. Bi-parting curtains shall have a one-half panel foldback on the leading edge.
13. Vertical seams shall be a straight set of stitches, continuous, and parallel.
14. All selvedge edges shall be clipped to prevent puckering.
15. Pipe pockets when specified shall be fully lined, and at least 3" higher than the final bottom finish of the goods.
17. Chain Pockets when specified shall be fully lined, and at least 2" higher than the final bottom finish of the goods, and contain #8 plated jack chain sewn in at the ends.

18. Pockets may be sewn on the back of the goods where a skirt or apron on the face is called for.
19. Number 4 Black anodized grommets shall be machine set on:
 - a. Each top corner,
 - b. 4" in from any leading edge of bi-parting panels,
 - c. And 12" on center, (or may be 9" on center for widths other than 54" wide).
20. Double tied installed Tie Lines shall be at least 36" long, #4 black braided cotton line.
22. All finished goods shall hang straight and square.
23. A 12" X 12" flame test panel shall be sewn on the top rear of each fabricated panel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Project Conditions: Examine all attachment areas and conditions under which the curtain tracks are to be installed. Work shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Architect.
- B. Before fabrication and installation, verify field dimensions and structural capabilities at attachment areas per job conditions.
- C. Quality Control: Coordinate with other trades as required. Provide protection for installed curtains and related units.

3.2 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.3 INSTALLATION

- A. Install curtain tracks in locations as indicated in the Curtain Track Schedule on drawings. Contractor will be responsible to verify with District, if suitability is doubted. Notify the District before installation into any apparent improper locations or interference with other work.
- B. Notify Architect 48 hours in advance prior to installation of soft goods so that they can be on site to verify appropriate hang.
- C. Install stage curtains and drops at locations indicated on Curtain Matrix on drawings. Refer to Plan and Section views for exact locations.
- D. Hang soft goods so that they are 1-1/2" from the finished floor.

3.4 FIELD QUALITY CONTROL

- A. At the completion of the project, the stage curtain systems shall be made available, with the installer, for inspection by the Architect or District Representative

END OF SECTION

09/21/18

SECTION 12 24 13
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually operated roller shades with single rollers.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 05 40 00 "Cold-Formed Metal Framing" for blocking and backing for attachment of shades to metal substrate.
 - 2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
 - 3. Section 09 22 16 "Non-Structural Metal Framing" for blocking and backing for attachment of shades to metal substrate.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. American Type Culture Collection (ATCC):
 - 1. 9642, 9644, 9645 - Fungi, Yeast and Yeast Genetic Stock
- C. ASTM International:
 - 1. ASTM G 21 - Determining Resistance of Synthetic Polymeric Materials to Fungi.
- D. Federal Specifications:
 - 1. FS CCC-T-1Slb: Flame Retardancy of Textiles.
- E. Glass Association of North America:
 - 1. GANA - Glazing Manual.
- F. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code.
 - 2. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Film.
- G. State of California Code of Regulations:
 - 1. Title 19 - Public Safety, State Fire Marshal.
- H. Underwriters' Laboratories, Inc. (UL)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Submit drawings, including actual measurements taken at the project where practical. Drawings shall include head, jamb and sill details as necessary to coordinate work with surrounding conditions and construction.
 1. Provide elevations, sections, and details. Show tube and bracket sizes for each condition.
 2. Show size and location of blocking and backing required for installation of shades. Show mounting details and method of attachment of shades to backing.
- C. Selection Samples: For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: Submit one fully operational window shade sample, not less than 16 inches wide by 36 inches long for each type of roller shade indicated, complete with selected aluminum trim showing color and shade cloth including sample of seam/batten when applicable.
 1. Valance/Fascia: Submit 3" samples of specified finish.
- E. Product Schedule: Provide schedule of chain operated clutch roller shades. Use the same designations as indicated on drawings. If necessary, indicate tube diameter for each shade.
- F. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Submit a letter indicating that installer is authorized by the manufacturer to install specified product.
- B. Product Certificates: For each type of shadeband material, signed by product manufacturer.
- C. Installation Instructions: Submit complete manufacturer's installation instructions.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades to include in maintenance manuals. Include maintenance procedures, recommended maintenance materials, parts diagrams, and suggested schedule for cleaning. Include precautions about cleaning materials that could damage or discolor the shade fabric.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm specializing in manufacturing manual roller shades with at least 7 years experience.
- B. Installer Qualifications: Approved by roller shade manufacturer. Installers shall be specially trained in the installation of chain operated clutch roller shades. Installers shall have completed at least 5 commercial installations of chain operated clutch roller shades similar to those specified in this Section.
- C. Fire-Performance Characteristics: Fabrics shall be inherently flame retardant material or shall be flame retardant treated to comply with the small scale and large-scale test requirements of

NFPA 701 and 2013 California Code of Regulations, (CCR) Title 19, Section 1273.3. If treated, fabric shall pass the small and large scale test after being subjected to the accelerated dry cleaning or laundering cycles specified in NFPA 701. Material requiring flame retardant treatment shall be treated by an applicator holding a valid "Flameproofers Certificate" from the State Fire Marshal.

- D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Do not deliver shades to the project until all concrete, masonry, plaster and other wet work has been completed and is dry. Deliver prefabricated shades to site in labeled protective packages, uniquely identified for each intended location. Schedule delivery to prevent delays but minimize on-site storage.
- B. Storage: Store materials in manner recommended by shade manufacturer, inside, under cover, and in manner to keep shades dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

1.8 FIELD MEASUREMENTS

- A. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry. Air conditioning system shall be operating, and ambient temperature shall be between 60 degrees F. and 85 degrees F. Relative humidity shall be between 45 percent and 65 percent.
- B. Before Installation Begins:
 - 1. Roof shall be tight, windows and frames installed and glazed, and interior doors hung.
 - 2. Wet work including concrete, masonry, plaster, stucco, and terrazzo, shall be complete and dry.
 - 3. Application of gypsum wallboard, joint treatment, taping and sanding shall be complete and dry.
 - 4. Ceilings, window pockets, electrical, and mechanical work above the product shall be complete.

5. Flooring materials such as carpet, tile, etc. must be completed.

- C. Electrical power (110 volt AC) shall be available for installer's tools within 500 feet of product installation areas.

1.10 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- C. Special Warranty: Submit a written warranty signed by roller shade manufacturer and Contractor agreeing to repair or replace roller shade components that do not remain fully operational for the warranty periods specified below after date of "Substantial Completion. Warranty does not include failure of the bead chain.
1. Shade cloth: 25 years.
 2. Operating hardware: 25 years.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturer or equal:
1. Mariak Contract; www.mariak.com
 2. Mecho-Shade Systems, Inc.; www.mechoshade.com
 3. Draper, Inc.; www.draperinc.com
 4. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

- A. Chain operated clutch roller shade system shall consist of a roller, brackets to support the roller, a flexible fabric carried by the roller, a means of attaching the material to the roller, a bottom bar, and a chain operator to lift and lower the shade.

2.3 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Shadecloth Material:
1. Provide sufficient length of material to allow two complete wraps around roller when shade is fully extended. Roller-in-hem construction prevents fabric from being pulled off roller. Fabric is to be attached by double wide staples. No adhesive attachment is allowed.
 2. Subject to compliance with requirements, provide products by one of the following for general shading:
 - a. Phifer SheerWeave Performance Plus Interior Sun Control Fabric Style 2410.
 - 1) Composition: 35% fiberglass, 65% vinyl on fiberglass.

- 2) Mesh Weight: 14.1 oz./yd²
- 3) Openness Factor: Approximately 3%.
- 4) UV Blockage: Approximately 97%.
- 5) Greenguard Certified.
- b. Verosol "EnviroScreen" metallised fabric. Fabric is woven in a new screen-like construction 805 (G2) which combines a limited openness factor with an excellent view through. The fabric guarantees visual and thermal comfort while preserving a textile appearance.
 - 1) Fabric Density: Semi-transparent.
 - 2) Composition: Inherent FR Polyester.
 - 3) Weight per m²: 250 gm/ m².
 - 4) Thickness: 0.50 mm.
 - 5) Width: 75"/94".
 - 6) Color Fastness: ≤ 5.
 - 7) Formaldehyde Free: Yes.
 - 8) Anti-Static: Yes.
 - 9) PVC-free: Yes.
 - 10) Anti-microbial Properties: Yes, per ASTM E2149-01.
 - 11) Flame Retardancy:
 - a) DIN 4102 B1.
 - b) BS 5867 Part 2 Type B.
 - c) NFPA 701.
 - 12) Certification: Oeko-Tex Standard 100; ISO 140001, ISO 9001; Greenguard.
 - 13) Technical Performance:
 - a) Fabric Color Code: (000); To be selected by Architect.
 - b) Solar Transmission: 4%.
 - c) Solar Reflection: 68%.
 - d) Light Transmission: 4%.
 - e) Light Reflection: 67%.
 - f) UV Transmission: 2%.
 - g) Openness Factor (nominal): 2%.
 - h) Ra (Color rendering index): 98.
- c. Mermet Silver Screen™.
 - 1) Composition: 36% fiberglass, 64% vinyl, Ultra-fine layer of aluminum.
 - 2) Mesh Weight: 11.8 oz./yd²
 - 3) Fabric Thickness: 0.017 inch
 - 4) Openness Factor: Approximately 4%.
 - 5) UV Blockage: Approximately 96%.
 - 7) Greenguard Certified.
- d. Substitutions: Section 01 25 13 – Product Options and Substitutions.
3. Fire-Test-Response Characteristics: Material shall pass the following:
 - a. Small scale vertical burn: NFPA 701-1999, Test Method No. 1, and California Title 19.
 - b. Large scale vertical burn: NFPA 701-1999, Test Method No. 2.
 - c. Fire rating: NFPA Class A.
4. Anti-Microbial Characteristics: Shade cloth shall conform to requirements for 'No Growth' in accordance with ASTM G 21 results for fungi, using fungus samples ATCC 9642, 9644, and 9645.
5. Color and Pattern: As selected by Architect from manufacturer's standard colors and patterns.

C. Rollers:

1. Clutch Mechanism: Corrosion resistant PA-6 plastic with glass fiber and internal mechanism of Nylon 6 construction. Provide a heavy-duty single spring that creates a

positive mechanical relationship between the roller shade tube unit and the universal installation bracket to ensure stationary positioning in the static state. When activated the wrap spring shall release and permit the clutch to turn while reducing friction on the clutch. Clutch mechanisms with multiple springs are not acceptable.

- a. Clutch End Locking System: The clutch shall have a locking system, which prevents the shade from coming out of its brackets if the shade is operated incorrectly.
 2. Clutch Bracket: The clutch shall be fixed to the installation bracket with tech screws. It must be removable without having to remove the installation brackets from the wall. Clutch mechanism shall be fastened with screws and not riveted to the brackets.
 3. Spring Loaded Idle End Cap: The idle end of clutch shall be spring loaded to provide secure anchorage into end bracket and to provide for simple and easy installation.
 4. Spring roller diameter length and material as needed to support shade length, width, and material weight 1-1/4" diameter minimum x width needed to cover window.
 5. Use steel rollers for all shades exceeding 45 in width; heavy-duty springs and positive locking mechanisms.
- C. Tube Mechanism: Extruded T6 aluminum with a wall thickness not less than 0.062 inch. Each tube shall have at least one Secure Grip Spline fabric-fixing slot to increase the rigidity of the tube and eliminate sagging when the shade is operated. T5 aluminum is not acceptable.
1. Tube sizes shall be as proposed by manufacturer for each condition, and as indicated on approved submittals.
 2. Spline Mounting System: Secure Grip Spline Method, consisting of flexible PVC extrusion RF (radio frequency) or impulse welded to the shade fabric. The spline shall be inserted into a slot on the extruded aluminum tube. The spline shall provide a positive mechanical attachment of the shade band to the tube. The spline shall be designed to allow fabric to be easily removed and re-installed on the roller shade tube without having to remove the roller tube from the brackets. Splines that slide in the tube mechanism from the edge are not acceptable. Double-sided tape or glue methods of fabric attachment are not acceptable.
- D. Hembar:
1. Three Sided Welded Pocket (Bottom Weight): Aluminum extrusion one inch in height held inside a fabric bottom pocket. The bottom pocket shall be created by folding a 1-1/4 inch section of fabric behind the bottom of the shade and RF or impulse welding the fabric to itself. After the aluminum weight is inserted into the bottom pocket the edges shall be sealed by again RF or impulse welding the fabric edges to itself.
- E. Tube Mounting Brackets: Universal type, capable of attachment at top, face, and with left hand or right hand controls. Brackets shall accept end cap locking system. If selected without Valance/Fascia, bracket color shall be white or black, painted finish as selected. Zinc plated or mill finish brackets are not acceptable. Size shall be as required for each condition, and as indicated on approved submittals.
- F. Chain:
1. Chain: Qualified No. 10 stainless steel ball chain. Nickel plated steel chain not acceptable. Include cord clasp to be mounted at appropriate height above window sill side wall.
 2. Braided fabric cord is not acceptable.

3. Chain shall be rated for 90 lbs. breaking strength.

- G. Valance/Fascia: Provide an aluminum fascia in square profile to conceal the roller shade tube mechanism. Valance/fascia shall have a wall thickness of 5/16", with paint finish in color as selected by Architect from manufacturer's standard colors. The fascia shall be attached to the tube mounting brackets by snapping it into place on a hinge rib clip. Size shall be as required to conceal the roller tube and rolled-up shade fabric.

1. Where ends of fascia are exposed, provide end caps.

2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between [Inside] Jambs Installation: Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise. Comply with manufacturer's edge clearance standards and recommendations. Length equal to head-to-sill dimension of opening in which each shade is installed.
 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Fabricate shades square, and free of sharp edges, burrs or other defects.
- D. Shadeband Fabrication: Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8-inch in either direction per 8 feet of shade height due to warp distortion or weave design.
- E. Multi-banded Shades: Provide for operation of multiple shade bands by a single chain operator subject to manufacturer's design criteria. Multi-banded manually operated shades shall be capable of smooth operation when offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve (12 degree total offset).

2.5 FINISHES

- A. Aluminum Components: Architect shall select from manufacturer's standard silicone polyester based baked enamel.
- B. Steel Components: Cadmium-plated, satin-finished, or bonderized prior to painting with Manufacturer's standard baked-enamel finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work. Do not commence installation until conditions are satisfactory.

Commencement of installation indicates acceptance of site conditions by Contractor. Notify the Architect upon inspection when the project conditions are unacceptable for shade installation. Beginning of installation means acceptance of substrate and project conditions.

- B. Verify that room temperature is a minimum of 65 degrees F. and that painting and other dust-producing operations are complete.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware and accessories to provide smooth operation without binding.
- B. Install units within the following tolerances:
 - 1. Maximum variation of gap at window opening perimeter: 1/4-inch, per 8-feet (+/-1/8 inch) of shade height.
 - 2. Maximum offset from level: 1/16-inch per 5-feet of shade width.
- C. Mounting brackets for shades shall not be installed on window stops.
- D. Roller shade Locations: As indicated on Drawings.

3.3 ADJUSTING

- A. Adjust drive / brake mechanism of units for smooth operation. Adjust shade and shade cloth to hang flat without buckling or distortion. Replace any units or components that do not hang properly or operate smoothly.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

08/27/18

SECTION 12 35 83
SPECIALTY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Music instrument storage casework.
 - 2. Robe and Uniform Storage casework.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 09 65 13 - Resilient Base and Accessories.

1.2 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A208.1 - Particleboard.
- B. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM):
 - 1. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 2. ASTM C 1503 - Specification for Silvered Flat Glass Mirror.
 - 3. ASTM E 488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
 - 4. ASTM E 795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
- D. Audio Engineering Society (AES):
 - 1. AES-4id - AES information document for room acoustics and sound reinforcement systems -- Characterization and measurement of surface scattering uniformity.
- E. Builders Hardware Manufacturers Association (BHMA):
 - 1. ANSI/BHMA A156.9 - Cabinet Hardware.
- F. GREENGUARD Environmental Institute (GEI):
 - 1. GREENGUARD certified low emitting products.
- G. International Electrotechnical Commission (IEC)
 - 1. Requirements for listing and labeling of products.
- H. National Electrical Manufacturers Association (NEMA):

1. NEMA LD 3 - High Pressure Decorative Laminates.
- I. National Fire Protection Association (NFPA):
 1. NFPA 70 - National Electrical Code (NEC).
- J. Underwriters' Laboratories, Inc. (UL) and Underwriters' Laboratories of Canada (ULC):
 1. Requirements for listing and labeling of products.
- K. U.S. Department of Commerce, National Institute of Standards and Technology (NIST):
 1. DOC PS 1 - U.S. Product Standard for Construction and Industrial Plywood.
- L. California Air Resources Board (CARB).
- M. California 93120 - Formaldehyde Emissions Phase I.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets, installation instructions, and maintenance recommendations.
- B. Shop Drawings: Prepared by manufacturer. Include elevations showing casework components, details of each condition of installation, and types and locations of hardware and fasteners. Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other Work.
 1. Indicate seismic bracing and fastening requirements.
- C. Samples: If specifically requested for specified products; required for alternate products. For each color and finish for each exposed casework component.
- D. Warranty: Submit sample meeting warranty requirements of this Section.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years experience in manufacture of similar products in use in similar environments.
- B. Obtain music education casework through one source from a single approved manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle casework in accordance with manufacturer's recommendations. Ship to jobsite only after roughing-in, painting work, and other related finish work has been completed and installation areas are ready to accept casework and recommended temperature and humidity levels will be maintained during the remainder of construction.

1.7 COORDINATION

- A. Coordinate installation of blocking and supports in frame wall assemblies under work of other sections where required for anchoring casework.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's written warranty indicating manufacturer's intent to repair or replace components of music education storage casework that fail in materials or workmanship within 10 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:
 - 1. Fracturing or breaking of casework components including doors, panels, shelves, or hardware resulting from normal wear and tear and normal use other than vandalism.
 - 2. Delamination or other failures of glue bond of components.
 - 3. Warping of casework components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
 - 4. Failure of operating hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Wenger Corporation / JR Clancy; 555 Park Dr., Owatonna, MN 55060; Toll Free Tel: 800-493-6437; Fax: 507-455-4258; Local Wenger Rep.: Ben Tompkins, Cell: 502.553.2214; Ben.Tompkins@wengercorp.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 013 "Product Options and Substitutions".
 - 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time period allowed for substitution review:
 - a. Product data.
 - b. Samples of each type of product specified, including but not limited to the following:
 - 1) Door and casework panels.
 - 2) Grille doors.
 - 3) Hinges with through-bolting hardware.
 - 4) Latches with through-bolting hardware.
 - c. Project references: minimum of 5 installations not less than 5 years old, with owner contact information.
 - d. List of successful installations of similar products available for evaluation by Architect.
 - e. Sample warranty.
 - 2. Approved manufacturers shall meet separate requirements of Submittals.

2.2 MATERIALS

- A. Particleboard: ANSI A208.1, minimum 43 lb/cu. ft. density, composite products and adhesives, with no urea formaldehyde added.
- B. Fire Rated Particle Board: ANSI A208.1, minimum 45 lb/cu. ft. density ASTM E-84 class 1.
- C. Plywood: APA standards PS1-98 section 5.7.4 or 5.7.1 or ANSI /HPVA HP-1-2004

Panel provide with HDF skins to prevent grain telegraphing.

- D. Particleboard Thermoset Panels: Particleboard finished with thermally-fused polyester surfacing on both sides meeting performance properties of NEMA LD 3 for VGS grade, edge-banded, including the following:
 - 1. Surface Abrasion Resistance: Taber Wheel, 400 cycles, for solid colors.
- E. Polyethylene Shelves: High-density, one-piece, blow-molded or polyethylene, with radiused front edge, for abuse-resistant shelves. Same color throughout will not show scratches.
- F. PVC Edge Banding: Radiused PVC extrusions, 1/8 inch thick.

2.3 MUSIC INSTRUMENT STORAGE CASEWORK

- A. Basis of Design: UltraStor™ Storage Cabinets as manufactured by Wenger Corporation. Modular instrument storage casework with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.
- B. Seismic Performance: Comply with ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" based upon seismic design criteria indicated.
- C. Storage Casework Component Load Capacities:
 - 1. Storage Casework Wire-Grille Door Hinge: Each weld capable of resisting 400 lbf pull test without visible damage or permanent deformation.
 - 2. Storage Casework Full Grille Door Hinge: Full length door capable of supporting 315 lbs. through open and close cycle without permanent damage.
 - 3. Robe and Uniform Storage Casework Garment Hanger Rods: Capable of supporting vertical load applied uniformly along width of unit of 200 lbf.
- D. Robe and uniform storage casework with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.
- E. General: Provide through-ventilating instrument storage casework meeting requirements in System Description and Performance Requirements Articles.
- F. General: Provide through-ventilating robe and uniform storage casework meeting requirements in System Description and Performance Requirements Articles.
- G. Side Panels and Divider Panels: Particleboard thermoset panel with no urea formaldehyde added, 3/4 inch thick. Side panels machined to accept unit-to-unit through-bolting.
- H. Grille Doors: Bright basic steel wire, 5/16-inch and 3/16-inch diameter, with full 360 degree welds at T-joints.
 - 1. Provide for instrument storage casework.
 - 2. Provide for robe and uniform storage casework.
- I. Open Casework: Provide casework without doors.
 - 1. Provide for robe and uniform storage casework.
 - 2. Provide for casework indicated.
- J. Panel Edge Banding: 3 mm thick, heat-bonded, with radiused and profiled edges and corners.

- K. Shelving: Sized with adequate gap between shelving and casework side panels to allow air movement inside casework.
 - 1. Up to 27 inches wide: Removable molded polyethylene shelf, with impact-resistant, radiused front edge, mounted to cabinet wall with self-locking clip.
 - 2. Over 27 inches wide: For large instrument casework: Removable formed polyethylene shelf, ribbed, with high-impact-resistant, radiused front edge, supported by steel tube frame.
 - 3. Tubular steel supports are included for shelves over 19 inches wide.
- L. Casework Panel Color: As selected by Architect from manufacturer's standard colors.
- M. Filler Panels and Closure: 3/4 inch thick particleboard thermoset panels with no urea formaldehyde in Oyster color. Provide the following, cut to fit field conditions, where indicated:
 - 1. Wall filler between cabinet side and wall.
 - 2. Top filler between cabinet top and wall.
- N. Butt Hinges: 2-3/4 inches, 5-knuckle steel hinges made from 0.090 inch thick metal, ANSI/BHMA A156.9, Grade 1, with powder-coated finish, through-bolted to door and side panels and welded to grille door frames. Provide 2 hinges on compartment doors, and 4 hinges on full-height doors.
- O. Slide Latch: 0.105 inch min. thickness steel, with padlock eye, powder-coat finish, through-bolted to panel door and side panel and welded to grille door frames. Latches securely without padlock. Provide with clear plastic label holder for use with standard size labels; number system available for user to print. Padlocks furnished by Owner.
- P. Panel Connectors: 1/4-20 by 1.77 inch panel connectors, with steel thread inserts, powder coated to match panels.
- Q. Cabinet Levelers: Leveling glides with 3/8 inch diameter threaded steel rod in steel corner brackets, minimum two each per cabinet side, accessible from within unit, and concealed in completed installation.
- R. Carcass joinery includes lag screws powder coated to match substrate.
- S. Back panel 7/32 inch reinforced with 3/4 inch stretchers panels held in a dado groove and lag screwed in place.
- T. Fasteners: Manufacturer-recommended fasteners as required for casework substrate and project performance requirements, consisting of one or more of the following:
 - 1. Sheet Metal Screws: SAE J78, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 2. Wood Screws: ASME B18.6.1.
 - 3. Expansion Anchors in Concrete and Concrete Masonry Units: Carbon-steel, zinc plated.
 - 4. Hardware supplied to anchor the cabinets to the wall and to adjacent casework
- U. Finish: Steel Sheet, Steel Wire, and Exposed Fasteners. Urethane-based electrostatic powder coating, color as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine casework installation areas for compliance with requirements for installation

tolerances, location of blocking and other anchoring reinforcements, and other existing conditions affecting installation and performance of casework. Proceed with casework installation upon correction of unsatisfactory conditions.

3.2 CASEWORK INSTALLATION

- A. Install plumb, level, and true; using integral levelers. Install in accordance with manufacturer's recommendations and approved submittals.
 - 1. Install seismic bracing and fastening in accordance with approved shop drawings.
- B. Install hardware uniformly and precisely. Set hinges snug and flat. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- C. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind and close with uniform reveals.

3.3 CLEANING AND PROTECTING

- A. Repair or replace defective work as directed by Architect upon inspection.
- B. Clean casework surfaces. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.
- C. Turn over operation and maintenance instructions to Owner.

3.4 CASEWORK SCHEDULE

- A. Casework Types (product #'s) are shown on drawings.

END OF SECTION

08/27/18

SECTION 14 24 23

HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Hydraulic passenger elevators as shown and specified. Elevator work includes:
1. Standard pre-engineered hydraulic passenger elevators.
 2. Elevator car enclosures, hoistway entrances and signal equipment.
 3. Jack(s).
 4. Operation and control systems.
 5. Accessibility provisions for physically disabled persons.
 6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 7. Materials and accessories as required to complete the elevator installation.
- B. Related Sections:
1. Section 03 30 00 – Cast-in-Place Concrete: Installing inserts, sleeves and anchors in concrete.
 2. Section 05 50 00 – Metal Fabrications:
 - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
 3. Section 09 65 43 – Linoleum Flooring: Providing elevator car finish flooring.
 4. Section 09 91 00 – Painting: Field painting unfinished and shop primed ferrous materials.
 5. Section 22 00 00 - Plumbing: Sump pit and oil interceptor.
 6. Division 23: Heating, Ventilation and Air Conditioning.
 - a. Heating and ventilating hoistways and machine rooms.
 7. Division 26 Sections:
 - a. Providing electrical service to elevators, including fused disconnect switches.
 - b. Emergency power supply, transfer switch and auxiliary contacts.
 - c. Convenience outlets and illumination in machine room, hoistway and pit.
 8. Section 28 31 00 – Fire Alarm System: Heat and smoke sensing devices.
- C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the California Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Section 300 for hydraulic elevators. State or local requirements must be used if more stringent.
1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
 2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
 3. Elevator shaft walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
 4. Elevator hoistways shall have barricades, as required.
 5. Install bevel guards at 75 degrees on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
 6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket

- supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
 8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
 9. Machine room to be enclosed and protected.
 10. Machine Room temperature must be maintained between 55 degrees and 90 degrees F.
 11. If machine room is remote from the elevator hoistway, clear access must be available above the ceiling or metal/concrete raceways in floor for oil line and wiring duct from machine room.
 12. Access to the machinery space and machine room must be in accordance with the governing authority or code.
 13. Provide an 8" x 16" cutout through machine room wall, for oil line and wiring duct, coordinated with elevator contractor at the building site.
 14. All wire and conduit should run remote from either the hoistway or the machine room.
 15. When heat, smoke or combustion sensing devices are required, connect to elevator machine room terminals. Contacts on the sensors should be sided for 120 volt D.C.
 16. Furnish and install finished flooring in elevator cab.
 17. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
 18. Where gypsum board construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
 19. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
 20. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
 21. General Contractor shall fill and grout around entrances, as required.
 22. Elevator sill supports shall be provided at each opening.
 23. All walls and sill supports must be plumb where openings occur.
 24. Locate a light fixture and convenience outlet in pit with switch located adjacent to the access door.
 25. A light switch and fused disconnect switch for each elevator should be located inside the machine room adjacent to the door, where practical, per the National Electrical Code (NFPA No. 70).
 26. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway (or in the machine room).
 27. For signal systems and power operated door: Provide ground and branch wiring circuits, including main line switch.
 28. For car light and fan: provide a feeder and branch wiring circuits, including main line switch.
 29. Wall thickness may increase when fixtures are mounted in drywall. These requirements must be coordinated between the general contractor and the elevator contractor.
 30. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc..
 31. Locate telephone and convenience outlet on control panel.

1.2 SYSTEM DESCRIPTION

- A. Hydraulic elevator work is defined to include systems in which cars are hoisted either directly or indirectly by action of holeless, telescoping, beside-the-car, dual cylinders; (jack); complete with other components and devices indicated and as required for safely operating elevators of rated speed and capacity.

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

American National Standards Institute (ANSI)
National Fire Protection Association (NFPA)

1.4 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.
- B. Shop drawings:
 - 1. Show equipment arrangement in the machine room/control space, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 - 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 - 3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 - 4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Powder Coat Paint Selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- D. Plastic Laminate Selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- E. Metal Finishes: Upon request, standard metal samples provided.
- F. Submittal procedures and quantities are specified in Section 01 78 23 for Operation and Maintenance manuals, and Section 01 33 00 for all other submittals.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard five-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 DIVISION OF STATE ARCHITECT DEFERRED APPROVAL

- A. Deferred approval is required for hydraulic elevator system guide rails and support brackets.
- B. After Architect has reviewed the shop drawings and materials prepared and provided by Contractor for the Deferred Approval item, Architect will forward those materials to Division of State Architect for their review and comment.
- C. Contractor shall make all DSA required corrections, shall provide all DSA required documentation, and shall coordinate and resubmit those materials to Architect for forwarding to DSA.
- D. If a second round of corrections and resubmittals is required by DSA, Contractor shall be responsible for all time and coordination with DSA, without further involvement by Architect, or Contractor shall compensate Architect for their time if Contractor chooses to continue to involve Architect in the process with DSA.
- E. When Contractor has obtained DSA approval of the Deferred Approval materials, Contractor shall resubmit a copy of those same DSA-approved materials to Architect for Record. No work shall commence on a Deferred Approval item until all these requirements have been completed.

1.8 REGULATORY REQUIREMENTS

- A. Comply with applicable requirements of the following:
 - 1. Americans with Disabilities Act - Accessibility Guidelines (ADAAG).
 - 2. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
 - 3. California Code of Regulations (CCR) Title 8, Elevator Safety Orders of the State of California Division of Industrial Safety.
 - 4. The 2016 California Building Code (CBC) Title 24 Part 2 Section 11B-407, and 2010 ADA Standards for Accessible Design.
 - 5. NFPA 70 - National Electrical Code.
 - 6. NFPA 80 Fire Doors and Windows.
 - 7. California Department of Public Health Standard Method V1.1-2010, CA Section 01350
 - 8. Other applicable local and State rules and regulations.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen years experience in manufacturing, installing, and servicing elevators of the type required for the project.
 - 1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
 - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
 - 2. The manufacturer shall have a documented, on-going quality assurance program.
 - 3. ISO-9001:2000 Manufacturer Certified.
 - 4. ISO-14001:2004 Environmental Management System Certified.
- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than fifteen years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- C. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, UL10(B), and NFPA 80. Provide entrance assembly units bearing Class B or 1-1/2 hour label by a Nationally Recognized Testing Laboratory.
- D. Inspection and testing:
 - 1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 - 2. Arrange for inspections and make required tests.
 - 3. Deliver to the Owner upon completion and acceptance of elevator work.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.11 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.12 PROJECT CONDITIONS

- A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.13 WARRANTY

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
1. ThyssenKrupp Elevator; www.thyssenkruppelevator.com
 2. Otis Elevator Company; www.otisworldwide.com
 3. Kone Inc.; www.kone.com
 4. Schindler Elevator Corp.; www.schindler.com
 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: ThyssenKrupp Elevator; endura Model 3500, Twinpost Above-Ground (2-Stage).

2.2 DESIGN CHARACTERISTICS

- A. General: Provide manufacturer's standard pre-engineered elevator systems modified to comply with requirements specified herein; or, at manufacturer's option, provide custom manufactured elevator systems. Where components are not otherwise indicated, provide standard components produced by manufacturer as required for a complete system.
- B. Elevator Quantity: 1.
1. Elevator Model: endura Twinpost Above-Ground (2-Stage).
 2. Elevator Type: Hydraulic Passenger.
 3. Rated Capacity: 3500 lbs.
 4. Rated Speed: 80 ft./min.
 5. Operation System: TAC32H
 6. Travel: 14'-0"
 7. Landings: 2 total
 8. Openings:
 - a. Front: 2
 - b. Rear: 0
 9. Clear Car Inside: 6' - 8" wide x 5' - 5" deep.
 10. Cab Height: 8'-0" standard
 11. Hoistway Entrance Size: 3' - 6" wide x 7'-0" high.
 12. Door Type: Single Speed.
 13. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
 14. Seismic Design Requirements and Seismic Coefficients: As indicated in DESIGN CRITERIA as shown on Structural Drawing S1.1.
 15. Hoistway Dimensions: 8' - 4" wide x 6' - 11" deep
 16. Pit Depth: 4' - 0"
 15. Button and Fixture Style: Vandal Resistant Signal Fixtures.
 16. Special Operations: None.
 17. Security Features: None.
 18. Signals: Signa4 Signal Fixtures with Microban® antimicrobial protection.
Illuminated hall and car pushbuttons.
In-car position indicators.
Alarm bell.

- Telephone cabinet and cable to Elevator Controller.
19. Additional Features:
- a. Braille and Arabic plates.
 - b. Car door safety device.
 - c. Emergency lighting.
 - d. Seismic design per CCR Title 8.
 - e. Independent service.
 - f. Vandal resistant push buttons.
 - g. Rescue pack.
 - h. Protection pads and hooks.

2.3 MATERIALS, GENERAL

- A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350 as mentioned in paragraph 1.8.A.7 of this specification.
- B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's standard colors, patterns, and finish charts.
- C. Steel:
1. Shapes and bars: Carbon.
 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
 3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture's standard selections.
- C. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacturer's standard selections.
- D. Linoleum Flooring: Provided by Section 09 65 43.

2.4 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- D. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together,

mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section.

- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for overtravel or undertravel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform "flooded pit operation", which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.
- J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.5 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
 - 1. An oil reservoir with tank cover.
 - 2. An oil hydraulic pump.
 - 3. An electric motor.
 - 4. Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.
- D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
 - 1. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 - 2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 - 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
7. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.6 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
 2. Main landing door and frame finish: Stainless steel panels, no. 4 brushed finish.
 3. Typical door and frame finish: Stainless steel panels with no. 4 brushed finish.
- B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.7 PASSENGER ELEVATOR CAR ENCLOSURE

- A. Car Enclosure:
 1. Walls: Cab type a steel shell design, reinforced cold-rolled steel with an applied panel design. The applied panels design, shall be arranged vertically on wood core panels covered on both sides with stainless steel: ASTM A 167, No. 4 brushed finish.
 2. Reveals and frieze: Stainless steel, No. 4 brushed finish
 3. Canopy: Cold-rolled steel with hinged exit.
 4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a stainless steel, no. 4 brushed finish.
 5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with No. 4 brushed stainless steel.
 6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - a. Door Finish: Stainless steel panels: No. 4 brushed finish.

- b. Cab Sills: Extruded aluminum, mill finish.
 - 7. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls on front opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
 - 8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
 - 9. Protection pads and buttons: Provide one set of vinyl protection pads with metal grommets for the project. Provide pad buttons on cab front(s) and walls.
- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.8 DOOR OPERATION

- A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
- 1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
 - 2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
 - 3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
 - 4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
 - 5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
 - 6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
 - 7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.

- 8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.9 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Auxiliary Operating Panel: Not Required
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
- E. Special Equipment: Not Applicable.
- F. Security Features: Not Applicable.

2.10 CONTROL SYSTEMS

- A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
- B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- C. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.
- D. Special Operation: Not Applicable.

2.11 HALL STATIONS

- A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All fixtures shall be vandal resistant type
 - 1. Provide one pushbutton riser with faceplates having a No. 4 brushed stainless steel finish.
 - a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
- C. Hall Position Indicator: Not Applicable.
- D. Hall Lanterns: Not Applicable.
- E. Special Equipment: Not Applicable.

2.12 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pit and machine room/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- C. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

- D. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- E. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- F. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- G. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
- H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
- I. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
- J. Lubricate operating parts of system where recommended by manufacturer.
- K. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.
- L. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

3.3 FIELD QUALITY CONTROL

- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise Owner, Contractor, Architect, IOR, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.

- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
 - 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.
- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 MAINTENANCE SERVICE

- A. Furnish maintenance and call back service for a period of 12 months for each elevator beginning at Substantial Completion, during normal working hours excluding callbacks.
 - 1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
 - 2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
 - 3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.
- B. Continuing Maintenance: Provide continuing maintenance at the expense of the Owner for a period of 60 months starting on date initial 12-month maintenance service is concluded. Include all inspections, lubrication, fluid levels, rollers, guides, controls, in accordance with maintenance contract.

END OF SECTION

04/01/19

SECTION 14 42 16

VERTICAL WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Unenclosed, pit-mounted, self-contained vertical platform wheelchair lift and accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete: Concrete slab-on-grade and anchor placement.
 - 2. Section 09 22 16 - Non-Structural Metal Framing: Blocking in framed construction for lift attachment.
 - 3. Division 26 - Electrical: Lighting and wiring connections at lift enclosure space; and electrical power service and wiring connections.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. The American Society of Mechanical Engineers International:
 - 1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
- C. American National Standards Institute:
 - 1. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- D. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.

1.3 DEFINITIONS

- A. Lift: Complete lift assembly including drive system, guide rails, platform, safety barriers, signals, control system, electrical wiring, and devices necessary to provide specified or required performance, operations, safety, security, and State approval.

1.4 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Submit manufacturer's catalog data, specifications, and other data for the wheelchair lift as necessary to demonstrate compliance with these specifications. Include rated capacities, dimensions, performances, operations, safety features, controls,

and finishes. Provide printed installation instructions and general recommendations for the lift unit specified.

- C. Shop Drawings: Submit shop drawings for wheelchair lift showing general arrangement, loads of the equipment, relationship to adjacent construction, space requirements, wiring and other features required for proper installation and operation of the lift.
- D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit manufacturer's operating and maintenance instructions, parts list with sources indicated, recommended parts inventory list, emergency instructions, and similar information. Include service data including address and telephone number of nearest authorized service representative.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by governing authorities for normal, unrestricted use of lifts.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain wheelchair lift only from manufacturer with a minimum of 10 years of documented experience in the manufacturer of wheelchair lifts of the types required.
- B. Installer Qualifications: Engage the lift manufacturer or an installer licensed by the State of California with a minimum of 5 years experience installing and maintaining Vertical Lift equipment in the State of California, approved by the lift manufacturer who has completed lift installations similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

1.8 REGULATORY REQUIREMENTS

- A. Comply with applicable requirements of the following:
 - 1. California Code of Regulations (CCR) Title 8, Elevator Safety Orders of the State of California Division of Industrial Safety.
 - 2. 2016 California Building Code (CBC) Title 24 Part 2, and 2010 ADA Standards for Accessible Design.
 - 3. Other applicable local and State rules and regulations.
- B. Provide platform lifts in compliance with:
 - 1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
 - 2. NFPA 70 - National Electrical Code.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.10 PROJECT CONDITIONS

- A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.11 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Submit written warranty agreeing to repair or replace defective materials and workmanship of the wheelchair lift during the warranty period at no cost to the District.
- C. Defective materials and workmanship is defined as operational failures, performance below required minimums, excessive deterioration or aging, evidence that the system will not be reasonably maintainable for the life of the building, abnormal wear, unsafe conditions, excessive noise or vibration, and similar unusual conditions.
- D. Warranty period shall be 2 years from date of "Substantial Completion".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Garaventa Lift; www.garaventlift.com
 - 1. Basis-of-Design Product: Genesis Opal Unenclosed Vertical Platform Lift.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 13 – Product Options and Substitutions.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
- B. Steel Tubing: Either cold-formed or hot-formed steel tubing.
 - 1. Cold-Formed Steel Tubing: ASTM A500.
 - 2. Hot-Formed Steel Tubing: ASTM A501.
- C. Steel Pipe: ASTM A53; standard weight (Schedule 40), unless otherwise indicated or required by structural loads.
- D. Carbon-Steel Sheet: Either cold-rolled or hot-rolled, commercial-quality carbon steel.
 - 1. Cold Rolled: ASTM A1008.
 - 2. Hot Rolled: ASTM A1011.
- E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation, commercial quality.

- F. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.
 - 1. Extruded Aluminum: ASTM B221, 6063-T6.
- G. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing structural members, guide rails, machines, and other lift components.
- H. Expansion Anchors: Anchor-bolt-and-sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to the load imposed as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107.

2.3 UNENCLOSED VERTICAL WHEELCHAIR LIFT

- A. Capacity: 750 lbs rated capacity.
- B. Mast Height:
 - 1. Model GVL-OP-42; 45 inches maximum lifting height.
- C. Platform Size and Nominal Clear Platform Dimensions:
 - 1. Standard: 36 inches by 48-7/8 inches clear platform dimensions.
- D. Platform Configuration:
 - 1. Straight Through: Front and rear openings.
- E. Landing Openings: Gates shall be self closing type.
 - 1. Gate Height: 42-1/8 inches.
 - 2. Platform Gate: Travels with platform and opens at lower landing.
 - 3. Upper Landing Gate: Installed at upper landing.
- F. Lift Components:
 - 1. Machine Tower: Custom aluminum extrusion.
 - 2. Base Frame: Structural steel.
 - 3. Platform Side Wall Panels: 16 gauge galvanized steel sheet.
 - 4. Side Guard Panels: 42-1/8 inches high mounted on platform.
- G. Base Mounting at Lower Landing:
 - 1. Pit Mount: Lift to be mounted in pit with dimensions to meet manufacturer's requirements for the platform size specified. Pit construction shall be in accordance to Section 03 30 00.
- H. Hydraulic Drive:
 - 1. Drive Type: Chain hydraulic.
 - 2. Emergency Operation: Manual device to lower platform and battery auxiliary power (compliant with CBC Sec. 11B-207.2) to raise or lower platform.
 - 3. Safety Devices:
 - a. Slack chain safety device.

- b. Shoring device.
 - 4. Travel Speed: 17 fpm.
 - 5. Motor: 3.0 hp (2.2 kW); 24 volts DC.
 - 6. Power Supply:
 - a. 120 VAC single phase; 60 Hz on a dedicated 15 amp circuit.
 - b. Powered by continuous building mains converted to a 24 VDC, equipped with auxiliary power system capable of running lift up and down for a minimum of 5 trips with rated load.
- I. Platform Controls: 24 VDC control circuit with the following features.
 - 1. Direction Control: Constant pressure rocker switch.
 - 2. Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm with battery backup.
 - 3. Keyed operation.
 - 4. Emergency Signal: Platform shall be equipped with emergency signally devices in accordance with the requirements of ASME18.1, par. 3.11.1:
 - a. The lift shall be provided with an audible signaling device, operable from the emergency stop switch, marked also with "ALARM" or from a separate switch marked "ALARM," which is located in or adjacent to each platform operating panel. The switch marked "ALARM" shall illuminate when actuated. The signaling device shall be audible inside the platform and outside the runway. The audible signaling device shall have a rated sound pressure rating of not less than 80 dBA nor greater than 90 dBA at 10 ft and respond without delay after the switch has been activated.
- J. Call Station Controls: 24 VDC control circuit with the following features.
 - 1. Direction Control:
 - a. Constant pressure rocker switch.
 - 2. Keyed operation.
 - 3. Call Station Mounting:
 - a. Lower: Wall mounted surface. 24" minimum from gate swing.
 - b. Upper: Wall mounted surface.
- K. Safety Devices and Features:
 - 1. Grounded electrical system with upper, lower, and final limit switches.
 - 2. Tamper resistant interlock to electrically monitor that the gate is in the closed position and the lock is engaged before lift can move from landing.
 - 3. Electrical disconnect shall shut off power to the lift.
 - 4. Under platform safety pan with five waterproof safety switches to detect obstruction under platform.
 - 5. Auxiliary Power System: Hydraulic drive system shall be equipped standard with a self-contained auxiliary power system (battery back-up) connected to a trickle charger. If the building power fails the system shall switch to the battery back-up circuit. The auxiliary power system is designed to provide power to operate the lift in the up and down direction and is capable of completing 5-7 return trips, under full load (750-pounds) to a height of 45-inches if mains power is lost.
- L. Finishes:
 - 1. Aluminum Extrusions: Champagne anodized finish.
 - 2. Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify shaft and machine space are of correct size and within tolerances.
- C. Verify required landings and openings are of correct size and within tolerances.
- D. Verify electrical rough-in is at correct location.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. General: Install lifts in accordance with applicable regulatory requirements including ASME A 18.1 and the manufacturer's instructions.
- B. Install system components and connect to building utilities.
- C. Accommodate equipment in space indicated.
- D. Startup equipment in accordance with manufacturer's instructions.
- E. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing: Upon completion of lift installation, and before permitting the use of lifts, perform acceptance tests including weight tests as required and recommended by ASME A18.1 and by State authorities having jurisdiction. Include State permits required for first year of operation
- B. In addition to above testing, test operate lift continuously between lowest and highest landings served, lifting full-rated capacity load for a minimum period of 30 minutes. Readjust stops and other devices and signal equipment for accurate landings and operation of system.
- C. Schedule tests with agencies, Owner's Representative, and Contractor present.

3.5 DEMONSTRATION

- A. Instruct Owner's maintenance personnel in the proper use, operation, and maintenance of lifts. Review emergency provisions, including access and procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete maintenance program.

- B. Check each lift operation with Owner's maintenance personnel present before Notice of Completion. Determine that control system, operating components, and safety devices are functioning properly.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance: Beginning at Notice of Completion, provide 24 months full maintenance by skilled employees of the lift installer. Include bi-annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.

END OF SECTION

01/04/19

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Construction Services Agreement, including General and Special Conditions, Division 1 apply to this section.

1.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, tools, equipment, services, and transportation necessary for, or reasonably incidental to, the construction and completion order of the fire protection work, including, but not limited to, the following:
 - 1. The installation of an automatic fire sprinkler system complete and ready for operation, for the entire building including but not limited to the mechanical equipment connection to the water main for a fully functional system.
 - 2. Prepare shop drawings, product submittals based on DSA-approved design documents and obtain all necessary approvals. Any major changes Contractor to verify existing site conditions and coordinate with other trade before construction work.
 - 3. Sprinkler system shall be monitored by a central alarm monitoring company. This monitoring shall include water flow indicators and tamper switches on all control valves.
 - 4. Provide complete as-built drawings of the fire sprinkler and standpipe system in AutoCAD 2013 version (or higher) using architectural backgrounds. Drawings shall include exact locations of all piping, sprinkler heads, sprinkler control valve assemblies, pipe supports, bracing, etc.
 - 5. Pay for all necessary fees.
 - 6. Painting of exposed piping and supports.
 - 7. Testing and adjusting of completed work, inspections and instructions. All inspections, testing and maintenance work required by NFPA 25, California 2013 Edition, and recommended by the equipment manufacturer shall be provided. Work shall include operation of sprinkler system alarm and supervisory devices.
 - 8. Repair of all damage done to premises as a result of this installation and removal of all debris left by those engaged in this installation.
 - 9. Excavation, trenching and backfill required in this section of work.

1.3 RELATED WORK

- A. Section 07 84 13, Penetration Firestopping.
- B. Section 07 92 00, Joint Sealants.
- C. Section 08 31 13, Access Doors and Frames.
- D. Section 09 91 00, Painting.
- E. Section 22 00 00, Plumbing.
- F. Section 28 31 00, Fire Alarm System.
- G. Division 26, Electrical.
- H. Division 33, Utilities.

1.4 REFERENCES AND STANDARDS

- A. Regulatory compliance: All work performed under this Division shall comply with the latest currently adopted editions of all codes and regulations. The following references and standards are hereby made a part of this Section and work shall conform to applicable requirements herein except as otherwise specified herein or shown on the Drawings.
- B. Codes and Standards: Conform to all applicable codes and standards as stated herein and as described in Division 1, including the following:
 - 1. California Building Code, 2016 Edition.
 - 2. California Fire Code, 2016 Edition.
 - 3. State of California Administrative Code (CAC) Titles 8, 17, 21, 22 and 24.
 - 4. California Electrical Code (CEC), 2016 Edition.
 - 5. Comply with all ADA and California Title 24 requirements for disabled access.
 - 6. Division of State Architect, State of California (DSA).
 - 7. Local Fire Prevention Bureau requirements.
 - 8. Comply with the latest edition of all applicable standards, including ANSI, ASTM, and OSHA.
 - 9. NFPA - National Fire Association Compliance: Install fire protection systems in conformity with the requirements of the currently adopted editions of the following:
 - a. NFPA 13, 2016 Edition - Standard for the Installation of Sprinkler Systems
 - b. NFPA 24, 2016 Edition - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
 - c. NFPA 25, California 2013 Edition - Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems.
 - d. NFPA 70, 2014 Edition - National Electrical Code.
 - e. NFPA 72, 2016 Edition - National Fire Alarm and Signaling Code.
- C. Minimum requirements: The requirements of these Specifications are the minimum that will be allowed, unless such requirements are exceeded by applicable codes or regulations, in which the local regulatory code or regulation requirement shall govern.
- D. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted Authorities Having Jurisdiction and from the Owner's Representative.

1.5 WORK RESPONSIBILITIES

- A. Site Conditions:
 - 1. Examine the drawings and the specifications, survey the existing site conditions, and include necessary allowances in bid proposal.
 - 2. Resolve conflicts with code requirements, site conditions, the work of other trades, or other mechanical contractors.
 - 3. Verify the location of all existing utilities prior to construction and protect from damage.
 - 4. Pay all costs incurred due to damage of existing utilities or other facilities.
- B. Responsibility:
 - 1. Provide complete functioning systems and include all labor, material, associated tools, and transportation required for the system to operate safely and satisfactorily.
 - 2. Provide all work necessary for a complete wet fire protection system regardless if specifically mentioned in the specifications.
 - 3. Coordinate the installation of fire protection items with the schedules for work of other trades and other contractors to prevent delays in total work. Assume responsibility for any cooperative work which must be altered due to lack of proper coordination or failure to make proper provisions in time.
 - 4. Be specifically responsible for ensuring that coordination between the fire sprinkler system work and the fire detection and alarm system work takes place to ensure full awareness of the location of all fire sprinkler system components (including, but not

limited to, control valves, flow switches, supervisory switches and alarm bells) requiring connection to the fire detection and alarm system.

1.6 PERMITS, LICENSES, AND INSPECTIONS

- A. Obtain and pay for all permits, fees and inspections required by work under this Section.
- B. Inspections: A pre-test for the EOR and IOR shall be carried out prior to the inspection by the Authority Having Jurisdiction from the start to the finish without any repairs or the test restarts from the beginning. All work shall be regularly inspected by the Authority Having Jurisdiction. Certificates of approval shall be delivered to the Owner's Representative. Be responsible for notifying the authority having jurisdiction when work is ready for inspection.

1.7 DRAWINGS

- A. Drawings indicate general arrangement of piping and equipment. Should it be necessary to deviate from arrangement or location indicated to meet architectural conditions or site conditions, or due to interference with work in other divisions, such deviations as offsets, rises, or drops in piping that may be necessary, whether shown or not, shall be made at contractor's expense.

1.8 COOPERATION WITH OTHER TRADES

- A. Schedule work and cooperate with other divisions to avoid delays, interferences and unnecessary work, conforming to construction schedule, making installation when and where required. A special effort shall be made to coordinate with the mechanical contractor so as not to block installation of the mechanical systems. The clearances above ceilings on this project are limited and the ductwork is to have the highest priority. All fire sprinkler work is to be coordinated with the mechanical contractor such that the ductwork can be installed in the locations shown on the mechanical drawings. If installed work is later found to interfere with work of other divisions, make all necessary changes at contractor's expense.

1.9 QUALIFICATIONS OF INSTALLERS

- A. Qualifications:
 - 1. Effective July 1, 2018, a certification card issued by the California State Fire Marshal is required for all fire sprinkler system pipe fitters responsible for installing, altering or repairing water based fire protection system. There must be at least one certified fitter per job site.
 - 2. For the actual installation, and testing of work under this section, use only thoroughly trained and experienced work personnel completely familiar with the items required and the manufacturer's current recommended methods of installation.
 - 3. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill.
 - 4. The execution of the work shall be in strict accordance with the best practice of the trades, the intent of this specification, and all codes and ordinances.
- B. Contractor's Qualifications: A firm with at least five (5) years of successful installation experience on projects with fire protection systems work similar and of comparable size and scope to that required for this project. The installer shall have performed at least five (5) similar projects in the San Francisco Bay Area. Contractor shall be prepared to submit written evidence of the installer's experience. Installation of all sprinkler piping, and appurtenances shall be done only by a licensed, fire-protection engineering contractor with at least five (5) years' experience in designing and installing sprinkler and standpipe systems. The Contractor shall possess a valid and current State of California C-16 contractor's license, and shall have held this license under the currently-licensed business name, for a period of not less than five (5) years as of the date of bidding the project and regardless of whether any other license classification is also held. Contractor shall be

capable of providing on-site emergency service within four hours of notification. The contractor shall be capable of providing drawings in AutoCAD 2013 version (or higher) format.

- C. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- D. **Products and Product Listing:** All materials and equipment installed as part of this work shall be new and free of defects. All piping components, equipment, valves and other devices shall be UL listed and/or FM approved for fire sprinkler use.
- E. **Welded Joints:** Weld in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified per the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test report. Contractor shall conduct the ANSI qualification test. Permits for on-site welding/brazing/soldering shall be obtained from DSA and/or the Authorities Having Jurisdiction.

1.10 QUALITY ASSURANCE

- A. Bring to the Owner Representative's attention prior to installation, any conflicts with other trades which will result in unavoidable contact to the equipment, piping, described herein, due-to inadequate space, etc.
- B. Bring to the Owner Representative's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation.
- C. Provide written notification to Owner's Representative a minimum of fourteen (14) days prior to a utility shut down.
- D. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such closure.
- E. **Restoration of Damage:** Repair or replace, as directed by Owner's Representative, materials and parts of premises which become damaged as result of installation of work of this Division. Remove replaced parts from premises.

1.11 PRODUCT HANDLING

- A. **Protection:** Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades.
- B. **Replacements:** In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.
- C. **Protection of Materials:**
 - 1. Protect materials, equipment and apparatus provided under this Division from damage, water, dust, or similar impairment, both in storage and installation until Notice of Completion has been filed. Materials, equipment or apparatus damaged because of improper storage or protection will be rejected and must be removed from site.
 - 2. Cap openings in pipes with manufactured caps or fittings. Do not use taped caps.
 - 3. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

1.12 REVIEW OF CONSTRUCTION

- A. The Owner's Representative may review work at any time.

- B. Advise Owner's Representative fourteen (14) calendar days in advance that work is ready for review at following times:
 - 1. Prior to buried work.
 - 2. Prior to concealment of contract items those have been completed.
 - 3. When requirements of Contract have been completed.
 - 4. Prior to installation of suspended dry wall and ceiling.
- C. Do not backfill or conceal work without Owner Representative's consent.
- D. Maintain on job a set of specifications and drawings for use by the Owner's Representative.
- E. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

1.13 SYSTEM ACCEPTANCE

- A. Acceptance shall be contingent on:
 - 1. Completion of the installation of all systems required for a complete and functional wet sprinkler system.
 - 2. Submission and acceptance of operating and maintenance data.
 - 3. Completion of pipe and valve identification.
 - 4. Completion of cleaning.
 - 5. Satisfactory operation of all systems for a period of one (1) week.
 - 6. Satisfactory completion of the acceptance tests which shall demonstrate compliance with all performance and technical requirements of the Contract Documents.
 - 7. Submission of as-built drawings.
 - 8. Final inspection and acceptance by DSA (Division of State Architect), Local Fire Prevention Bureau, and Authorities Having Jurisdiction.

1.14 DAMAGE BY LEAKS

- A. Be responsible for damage to any part of the premises caused by leaks in the pipe or equipment installed under applicable section for a period of twelve (12) months from the date of acceptance of the work by the Owner.

1.15 SUBMITTALS

- A. Submit product data in accordance with Division 1 and as follows:
- B. Submittal Requirements:
 - 1. Submit manufacturer's product brochures for all products. Written descriptions of products are not acceptable. Furnish, all at one time, prior to any installation, valid submittal data on material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on equipment schedules. Product submittals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Product Submittals" shall match "Operations and Maintenance Manuals".
 - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
 - 3. Submittals will be checked for general conformance with the design concept of the project, but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly design and install work.
 - 4. To be valid, all product submittals must:

- a. Identify project name and location, Contractor's, Subcontractor's, suppliers or manufacturer's name, address, and telephone number.
- b. Identify manufacturer's name and model numbers.
- c. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
- d. Include all pertinent construction, installation, performance and technical data.
- e. Have all product data sheets clearly labeled to indicate the individual item being submitted. In addition, all required options and accessories shall be clearly marked.
 - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding equipment tag number.
 - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, and item numbers.

C. Shop Drawings:

1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be prepared using AutoCAD 2000 (or higher), format. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, plumbing, and electrical in relation to architectural and structural features. Include minor piping, drains, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, etc.
2. Complete and detailed shop drawings of a scale no smaller than that of the design documents shall be maintained throughout the coordination and construction phase indicating the work of all trades clearly. All equipment including piping, etc. shall clearly identify both top and bottom elevations as well as distances from equipment to established building lines. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.
3. Use of contract documents for shop drawings is not acceptable. Any changes to the contract documents will be coordinated with the Architect and submitted to the AHJ for approval.
4. Required Drawings: Prepare and submit drawings for all areas and all fire protection work. Scale shall be minimum 1/4" = 1'-0" in mechanical rooms, and a minimum 1/8" = 1'-0" elsewhere.
5. Drawings shall be detailed in accordance with NFPA 13, 14 and 20. Shop drawings shall indicate accurate locations of all piping (with all exposed piping clearly designated), sprinkler heads, seismic braces, pipe anchors and hangers, drain locations, inspector test connections, and other apparatus associated with these systems in respect to architectural conditions, structural conditions, lighting layouts, diffuser layouts, plumbing, mechanical, and electrical layouts. Plans shall include necessary engineering features, including hydraulic reference nodes, pipe lengths and pipe diameters as required by the above-named code and standards. Complete, accurate legends for all symbols and abbreviations shall be provided on plans. Drawings shall have the same scale and same sheet size used by the other trades to facilitate coordination. Sprinkler shop drawings shall be coordinated with architectural drawings for head locations. Any wall and ceiling changes occurring prior to the submittal of contractor's shop drawings shall be incorporated into the contractor's detailed design at no additional contract cost.
6. Center of tile installation is mandatory.
7. Hydraulic calculations shall be executed on standard 8-1/2 x 11-inch sheets, conforming to the requirements of NFPA 13, and shall indicate pipe numbers, beginning and end node points, all referenced Shop Drawings, and system demand curves. Calculations shall be accomplished using an approved computer program and shall be bound and indexed in a three-ring binder matching "Product Submittals" and "Operating and Maintenance Manuals".

D. Product Data:

1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical

characteristics, finishes, color selection, and accessories. Include certified drawings on major equipment such as fire pumps.

- E. Submit product data and brochures for, but not limited to the following:
 - 1. Pipe Material and Fittings.
 - 2. Pipe supports including seismic pipe supports.
 - 3. Fire stopping, including listing system numbers and details.
 - 4. Sprinkler heads, each type and model.
 - 5. Spare sprinkler head cabinets.
 - 6. Valves (all types).
 - 7. Water measuring devices.
 - 8. Valve cabinets.
 - 9. Inspector's test alarm modules.
 - 10. Pressure gauges.
 - 11. Water flow switches.
 - 12. Valve supervisory switches.
 - 13. Alarm Bells.
 - 14. Fire department connections.
 - 15. Test header.
 - 16. Pipe, valve and Identification signs, etc.

1.16 RECORD DRAWINGS

- A. Record of Job Progress: Keep an accurate dimensional record of the "As-built" locations of all work as required. This record shall be kept up-to-date on prints as the job progresses and shall be available for inspection at all times. In addition, record drawings are to be used by the Owner's Representative for job review and field inspections.
- B. "As-Built" documentation shall be transmitted to the Owner within ten days after Owner Representative's acceptance of the completed installation. As-built documentation shall include the following (Unless noted elsewhere, furnish number of copies indicated):
 - 1. Two (2) copies shall be provided for each drawing. One (1) copy of final AutoCAD drawing files shall also be provided on CD disk, for each drawing.
 - 2. Four (4) sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
 - 3. Four (4) sets of hydraulic calculations and seismic bracing calculations for each sprinkler system updated to include any changes to the installations which affect the calculations.
 - 4. Four (4) sets of hydrostatic report and NFPA 13 material test certificate for each sprinkler system.
 - 5. Four (4) sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions.
 - 6. Manufacturer's literature, reports and operation and maintenance data shall be in a labeled three (3) ring binder.

1.17 OPERATION AND MAINTENANCE DATA

- A. The installing contractor shall provide:
 - 1. All literature and instructions provided by the manufacturer describing proper operation and maintenance of any equipment and devices installed.
 - 2. Publication titled NFPA 25, **California 2013 Edition**, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- B. Include, but not limited to the following: List of all equipment with Manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item. O&M manuals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Operation and Maintenance Manuals" to match "Product Submittals",
 - 1. System Description: Description of start-up and operating procedures.

2. Controls: Diagrams and description of operating sequence of each system.
3. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts list with parts numbers. Mark each sheet with equipment identification number and actual installed condition.
4. Materials and Accessories: Manufacturer's brochures parts list with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
5. Certificate of factory tests and code compliance as specified.
6. Recommend preventive maintenance schedule and procedures.

1.18 GUARANTEES

- A. At completion, provide the Owner's Representative a written guarantee, in triplicate, that work has been performed in accordance with Specifications and that Contractor shall replace or repair, to the satisfaction of the Owner's Representative any portion of the work that fails within the guarantee period after final acceptance provided such failure is due to defects in materials Also agree to replace or repair, with like workmanship and any part of the building or equipment installed by other trades but damaged by them in installing their work.
- B. During the guarantee period, make four (4) inspections of the work at three (3) month intervals after final acceptance to check the performance of systems and correct any guaranteed items. Inspections to be made in the presence of the Owner's Representative.
- C. Guarantee in writing all fire protection work for a period of twelve (12) months following date of certificate of final acceptance.
- D. All apparatus shall be built and installed so as to deliver its full rated capacity at the efficiency for which it was designed.
- E. All fire protection and electrical apparatus shall operate at full capacity without objectionable noise or vibration.
- F. The fire protection systems shall provide the performance required at standard operating conditions.
- G. Where a manufacturer's guarantee/warranty exceeds one (1) year, the longer shall govern.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. General: All pipe and fitting shall be new, acceptable to all Authorities Having Jurisdiction, conform to all applicable standards and codes, and be free from damage and distortion.
- B. Pipe shall be Black steel: Schedule 10 for 2-1/2" and larger sizes, Schedule 40 for 2" and smaller sizes. Piping outside building are galvanized steel, regardless of size.

2.2 VALVES

- A. Gate valves (Valves 2" and Smaller): MSS SP-80; UL listed and approved, 175 psi Non-shock cold water, bronze body, screw-over bonnet, threaded ends, outside screw and yoke, solid wedge, bronze trim, replaceable seat rings. Provide each valve with supervisory switch.
- B. Gate valves (Valves 2-1/2" and Larger): MSS SP-70; UL listed, and FM approved, 175 psi non-shock cold water, iron body, bolted bonnet, flanged ends, outside screw and yoke, solid

wedge, pre-grooved stem for supervisory switch mounting, bronze trim, replaceable seat rings. Provide each valve with supervisory switch.

- C. Butterfly valves (Valves 2" and Larger): MSS SP-67; UL listed and approved, California State Fire Marshal Listed, indicating type, gear operated, ductile iron lug type body, stainless steel stem, nickel plated ductile iron disc, Buena-N seat, 250 psi shock cold water. Provide each valve with a supervisory switch.
- D. Ball valves (Inspector's test and drain only-up to 2" max.): MSS SP-110; UL listed and FM Approved, full or standard port, two-piece bronze body construction, chrome plated solid bronze ball, blowout proof stem, and vinyl covered steel handle, 300 psi Non-shock cold water. Provide locking type handle.
- E. Check Valves (Valves 2" and Smaller): MSS SP-80; swing type check valve, screwed bonnet, horizontal swing, renewable disc, bronze body, threaded ends, 200 psi non-shock cold water.
- F. Check Valves (Valves 2-1/2" and Larger): MSS SP-71; UL listed and FM Approved, swing type check valve, bolted bonnet, horizontal swing, renewable seat and disc, iron body, flanged ends, 175 psi non-shock cold water.
- G. Check Valves: MSS SP-71; UL listed and FM Approved, swing type or wafer style silent check valve with double center guided conical spring type, 175 lb. WOG.
- H. Drain Valves and Inspector's Test Valves: UL listed, globe, straightway or angle type, ball or butterfly, bronze body, renewable disc, threaded, 150 lb. WOG, equipped with reducer and hose connection with cap or connected to a drain line.
- I. Valves install higher than 7'-0" shall be equipped with chain operators, or equivalent.

2.3 SPRINKLER HEADS

- A. The acceptable fire sprinkler head manufacturers are Tyco, Victaulic, Viking and Reliable.
- B. Exposed Structure Ceiling: UL listed, quick response pendent or upright type with brass finish, 1/2" orifice, quick response sprinkler, or equal. Chrome finish in Public Areas.
- C. In Finished Ceilings and Soffits: UL listed, quick response type, 1/2" orifice, with concealed type cover plate assembly, white finish, quick response concealed sprinkler, or equal.
- D. Temperature ratings shall be 155°F. Exception, sprinklers at skylights and electrical room shall be 200°F.
- E. Sprinkler heads as shown in some spaces, may be located closer together than required by code, but are required to maintain an orderly pattern.
- F. Provide spare heads of each temperature rating and type used in a suitable metal cabinet with red enamel finish, cabinet to be located at the direction of Owner's Representative. Number of spare heads in accordance with NFPA 13.
- G. Provide sprinkler head guards, UL listed, and FM approved for sprinkler heads subject to mechanical damage or for any sprinkler head lower than seven feet (7') above the floor, for all heads in all mechanical, electrical and elevator machine rooms. Head guards shall be factory painted red enamel.
- H. For sprinkler heads in exposed areas: Provide sprinkler heads with Teflon coating for corrosion resistance. All sprinkler heads exposed to the outside of the building shall be dry pendent type.

- I. Provide standard coverage heads, extended coverage sprinkler heads are not acceptable.
- J. Escutcheons shall be factory treated to receive paint.

2.4 HANGERS AND SUPPORTS

- A. Hangers and seismic sway bracing shall be designed and installed as required by NFPA 13 and NFPA 14 (including all appendices), and by the California Building Code. Provide steel bracing as to resist earthquake loads, as required for Seismic Zone IV. Specifically, these codes shall be interpreted such that all system components and supports shall be capable of resisting five times the weight of the water filled pipe plus 250 lb. downward; and 0.75 times the weight of the water filled pipe in all other directions. Flexibility, internal pressure, and differential movement between the piping and building shall be allowed for, so that no allowable stress is exceeded in any member.
- B. Hangers and components shall be U.L. listed and/or FM approved. All hanger and support components including seismic sway bracing components shall be of the same manufacturer.
- C. Hanger Rods: Hanger rod size shall be no less than the standard rod sizes listed on the MSS SP-69. Rods shall be steel rods, threaded at ends only with a minimum safety factor of 5 over the imposed load. All thread rods are not acceptable. Where rod stiffeners are required.
- D. Where beam clamps are used, provide beam clamp retaining strap.
- E. Powder-driven and explosive type fasteners are not allowed.
- F. The end sprinkler on a branch line shall be restrained against excessive vertical and lateral movement by use of a wrap-around hook or by other approved means per NFPA 13.
- G. When static pressure exceeds 100 psi, arm over and drops 12 inches and over requires a hanger.
- H. Where beam or joist thickness will not accommodate a fastener of a required length, through bolt with the required diameter of the bolt and washer will be acceptable. All thread rods are not acceptable for the required bolt.

2.5 PRESSURE GAUGES

- A. U.L. listed and labeled for fire protection sprinkler service, three-inch (3") dial, 0-300 psi scale with 5 psi increments, dual range twice the system working pressure, moisture and weather resistant, 1/4" bottom connection, shut-off valve, and brass socket.

2.6 WATER FLOW SWITCHES

- A. U.L. listed, California State Fire Marshal listed, and FM Approved, vane type flow switch with retard mechanism or manual adjustment to prevent false alarm, listed for indoor/outdoor use and have tamperproof cover. Provide each with two sets of SPDT contacts and conduit connection for wiring to remote alarm system, Potter Electric Signal Co., VSR, Notifier WFD, or equal. Coordinate installation with Division 28.

2.7 SUPERVISORY (TAMPER) SWITCHES

- A. U.L. listed, California State Fire Marshal listed, and FM Approved. Switches shall be listed for indoor/outdoor use, have tamperproof cover, each with two sets of SPDT contacts and conduit connection for wiring to remote alarm system. Switches shall be Potter Electric Signal Co., OSYSU-2 or equal, for OS&Y gate valves, and PIVS-U, or equal for butterfly

valves and post indicator valves. Coordinate installation with Division 28 and locate as required by Authorities Having Jurisdiction and as acceptable to the Architect.

2.8 EXTERIOR FIRE ALARM BELLS

- A. U.L. listed, California State Fire Marshal listed, and FM approved. Bells shall be listed for indoor/outdoor use, have under dome strikers and operating mechanisms and gongs on bells shall be no smaller than ten-inch (10") diameter with an operating voltage of 120 VAC and shall be suitable for surface or semi-flush mounting. Outdoor surface mounted installations shall be weatherproof using a weatherproof electrical box. Otherwise bells shall mount to a standard four-inch (4") square electrical box having a maximum projection of two and one-half inches (2-1/2"). Bells shall be Grinnell Model A with A3 trim, or equal. Coordinate installation with Division 28.

2.9 PIPING IDENTIFICATION

- A. All piping is to be identified as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, pressure sensitive self-sticking pipe markers consisting of pipe content wording and arrow indicating directions of flow on ANSI color background. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other. Provide at each end of each marker, two and one-fourth inch (2-1/4") wide self-sticking clear tape around periphery of pipe or insulation to further secure marker. All markers shall be applied to clean surfaces free of dust, grease, oil or any other material which will prevent adhesion. Install after cleaning, painting and insulation is complete. Pipe identification shall comply with ANSI A13.1 "Scheme for the Identification of Piping Systems".
- B. Location and visibility for pipe identification:
1. On all horizontal runs spaced twenty feet (20') maximum but not less than once in each room at entrance and exit of each concealed space.
 2. At each riser takeoff.
 3. Within one foot (1') of each valve and control device.
 4. At every change in directional flow.
 5. At every pipe passage through wall, floor and ceiling construction.
 6. Where capped piping is provided for future connections, provide legible and durable metal tags indicating symbol identification.
 7. At all wall and ceiling access panel/doors.
 8. Near major equipment items and other points of origination and termination.
 9. Pipe identification of sprinkler branch piping is not required.
 10. Attention shall be given to visibility with reference to pipe markings. Where pipe lines are located above or below the normal line of vision, the lettering shall be placed below or above the horizontal of the pipe.

C. Color Coding of Piping:

ANSI Color <u>Service</u>	Color of <u>Color Field</u>	Color of <u>Text</u>
Fire Protection Water	Red	White
Fire Sprinkler Water	Red	White

D. Size of Legend Letters:

<u>Outside Diameter of Pipe or Covering</u>	<u>Minimum Length of Color Field</u>	<u>Minimum Size of Text</u>
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"

2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

2.10 BURIED UTILITY WARNING AND TAPE

- A. All underground piping shall be identified with underground warning pipe markers as follows: Brady Perma-Code, Marking Services Inc., or equal, non-adhesive four (4) mil polyethylene plastic tape manufactured specifically for and identification of buried utility lines. Tape shall be of the type provided in rolls, six inches (6") width, color coded for the utility involved, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning identification for lines shall be "CAUTION WATER LINE BURIED BELOW". Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.
- B. During back-filling of fire line systems, install continuous underground type plastic line markers. Run detector tape continuously along pipe and terminate in adjacent valve boxes or other suitable facilities. No splices will be allowed. Protect tape from damage during installation and backfilling. Tape that is broken, cut or crumpled shall be completely replaced. Install twelve inches (12") above the top of the respective pipe twelve inches (12") below the surface during backfill. Provide detectable type for buried non-metallic pipes.
- C. Color Code of underground tape shall be as follows:

ANSI Color <u>Service</u>	Color of <u>Color Field</u>	Color of <u>Text</u>
Fire Protection	Blue	Black

2.11 VALVE TAGS

- A. All valves shall have brass identification tag as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, Brass valve identification tag secured with brass chain and "S" hook. Tags shall bear the service identification and numerical identification of the valve.
- B. Engrave identification tags with "normally open" (green) or "normally closed" (red).
- C. Tags:
 1. Minimum two inches (2") triangle for fire protection.
 2. No. 18 BS gauge brass with stamped numbers and letters filled in with black enamel paint. Engraving ink, dye and vinyl fill are not acceptable.
 3. Identifying number and system letter. Top line shall be 1/4" characters and should abbreviate the service. The second line shall be characters and should list the valve number. Example: 1st floor shall begin 101, second floor shall begin 201.
 4. Attach 6"-12" of brass jack chain around bonnet or stem of the valve in a way that it cannot accidentally come off. Attach appropriate size brass "S" hook to the chain in the most conspicuous location. Hang valve tag from the "S" hook. Valve tag should not be attached to the wheel causing interference with valve operation.
 5. Provide on: All valves and controls.

2.12 IDENTIFICATION

- A. Provide engraved plastic nameplates on all equipment, including but not limited to the following: Pumps (all types). Provide nameplates on each piece of equipment at disconnect and also at the breaker. Nameplates shall conform to the following, provided the equipment can accommodate the minimum sizes outlined:
 1. Black background with white lettering.
 2. Sizes: Equipment 2"x4", disconnect 1" x 2-1/2", breaker 1" x 3".

3. Lettering shall be 3/4" (1/4" minimum or sized for the maximum per nameplate.
 4. Nameplate shall be provided with both adhesive backing and screw holes to insure permanent application.
 5. Material shall be 2 ply 1/16" thick with beveled edges.
- B. Properly identify each piece of equipment and controls pertaining thereto by nameplates mounted on equipment and controls using round head brass machine screws, pop rivets or contact cement. Cardholders in any form not acceptable. Install with corrosion resistant mechanical fasteners and adhesive and seal with clear lacquer.
 - C. Place warning signs on machines driven by electric motors which are controlled by fully automatic starters, in accordance with Article 3281, General Industry Safety Orders.
 - D. Small devices, such as inline pumps, may be identified with tags.
 - E. Identify control panels and major control components outside panels with plastic nameplates.
 - F. Identify equipment out of view behind access doors, in unfinished rooms on the face of the access door.

2.13 VALVE AND EQUIPMENT CHARTS

- A. Provide five typewritten schedules giving numbers, service and locations, and notations of open or closed, of all tagged valves. Enclose each schedule in separate transparent plastic binder. List piping systems with symbol and color coding on pipe identification chart. List valve model numbers and symbol for service corresponding to piping symbol on valve identification chart. Provide small "key plan" identifying valves as related to column lines. Schematic flow diagrams of each piping system indicating:
 1. Location and function of each tagged valve.
 2. Type, size and essential features of each system.
- B. Submit drafts of valve schedule for review before preparing final sets.

2.14 IDENTIFICATION SIGNS

- A. Provide systems with identification signs as specified and as required by NFPA 13, NFPA 14 and any other code requirements.
- B. Fire sprinkler signs shall be made of 18-gauge minimum baked enamel aluminum and meet NFPA 13. Signs shall be printed red on white background or white on red background. Each sign shall have holes or slots to facilitate field attachment. All signs shall be secured using of tamper-resistant screws.
- C. Provide identification signs in accordance with referenced standards, to include, but not be limited to: the fire department connection(s), each control valve, each main or auxiliary drain valve, each inspector's test valve, and, for hydraulically-designed systems, a hydraulic system calculation nameplate. In addition, provide signs identifying all access panels concealing sprinkler control or test valves. Provide a sign on or directly below the local water flow alarm.
- D. A permanently installed, metal calculation plate shall be attached at the sprinkler riser indicating sprinkler specifications as required by NFPA 13. Use of plastic tape shall not be permitted on the calculation plate.
- E. Approved identification signs shall be provided for outside alarm devices such as bells, etc. The sign shall be located near the device in a conspicuous position and shall be worded as follows: "SPRINKLER FIRE ALARM - WHEN BELL SOUNDS CALL 911".

2.15 SLEEVES AND ESCUTCHEONS

- A. Sleeves: Provide sleeves for all pipes passing through slabs, concrete walls, lath and plaster ceilings (except drop nipples for sprinklers) and partitions. Sleeves shall extend three inches (3") above floors and be flush with walls, ceilings, and partitions. In concrete construction, sleeves shall be set in forms prior to pour. Clearance between sleeves and pipes shall be one inch for pipes up to three and one-half inches two inches (2") for pipe sizes four inches (4") and greater, and three inches (3") for seismic joints.
- B. Sleeve Materials:
 - 1. In concrete slabs and walls: Schedule 40 black steel pipe.
 - 2. Sleeves through waterproof membranes: Sleeves set in walls and slabs may be either cast iron or steel and shall be provided with a flashing clamp device and corrosion resistant clamping bolts.
- C. Escutcheons: Primer-coated steel set-screw type.

2.16 IDENTIFICATION SIGNS

- A. Seals shall be modular type consisting of interlocking synthetic rubber links shaped to continuously fill the space between the pipe and the opening, zinc galvanized plated bolt and nut, Thunderline Corporation "Link-Seal", Calpico Model CSL Pipe Linx, or with "Link-Seal" WS series steel wall sleeve.

2.17 ACCESS PANELS AND DOORS

- A. Furnish under this Division where shown, and required by Regulatory Agencies and for access of all concealed valves, etc. Doors in this Division shall be from same manufacturer as those specified under Section 08 31 13 for identical appearance and keying. Sizes: 24" x 24" inches minimum for ceilings and 12" x 12" minimum for walls. Furnish fire rated doors when located in rated walls and ceilings. Deliver doors for installation under Section 08 31 13. Mark each door to accurately establish its location.

2.18 FLEXIBLE, SPRINKLER HOSE FITTINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Vic-Flex
- B. Standard: UL 2443 and FM 1637.
- C. Type: Fully stainless steel AH2 flexible hose for connection to sprinkler, and with one-piece open-gate "Series AB1" bracket for connection to ceiling grid.
 - 1. The bracket shall allow installation before the ceiling tile is in place.
- D. Bend radius to manufacturer's requirements per hose clearance chart for proper installation in confined spaces.
- E. The hose shall be listed for (4) bends at 31" length. Union joints shall be provided for ease of installation.
- F. Pressure Rating: 175 psig minimum.
- G. Size: Same as connected piping, for sprinkler.

2.19 FLEXIBLE HOSE CONNECTORS

- A. Provide flexible hose expansion loop(s) as indicated on the contract drawings or as required to accommodate any thermal expansion, contraction or seismic movement of the piping system.
- B. Flexible hose expansion loops shall be manufactured complete with two parallel sections of corrugated metal house, compatible braid, 180 deg return bend, with inlet and outlet connections. Field fabricated loops shall not be acceptable.
- C. Flexible loops shall be capable of movement in the $\pm X$, $\pm Y$, and $\pm Z$ planes.
- D. Flexible hose expansion loops shall impart no thrust loads to system support, anchors or building structure.
- E. All flexible hose expansion loops shall be manufactured in accordance with the documented manufacturers weld procedure specifications. The procedure qualification record shall be used to document the execution of this procedure and shall follow the general "guidelines" of ASME Section IX. Each individual welder shall conform to the in-house procedure qualification record and be qualified prior to each production lot. The testing of each individual welder shall be documented in a welding procedure qualification record.
- F. Flexible hose expansion loops to be "Metraloop®" as manufactured by The Metraflex Company®, Chicago, IL or approved equal
- G. Corrugated Hose:
 - 1. Stainless Steel:
 - a. Type 304.
 - b. Type 321.
 - c. Type 316.
 - 2. 304 Stainless Steel braid shall be used for any series 300 stainless steel hose.
- H. Fittings Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings. Copper fittings shall not be attached to stainless steel hose.
- I. Flexible hose expansion loops shall have a factory supplied, hanger / support lug located at the bottom of the 180deg return.
- J. Flexible hose expansion loop(s) shall be furnished with a plugged FPT to be used for a drain or air release vent.

Loop Size	FPT Size
1" – 6"	3/8"
8" and Larger	1/2"
- K. Flexible hose expansion loop(s) shall be rated with an operating pressure in accordance with the table below. The operating pressure shall be based on burst pressure with a 4 to 1 safety factor.

Flexible Expansion Loop with Stainless Steel Hose

Size	Working Pressure at 70° F. Single Braid	Working Pressure at 70° F. Double Braid
2"	500	750
2-1/2"	387	600
3"	288	431
4"	232	371

PART 3 - EXECUTION

3.1 PREPARATION

- A. Sprinkler heads in all finished areas shall be installed on a true axis line in both directions with a maximum deviation from the axis line of plus or minus 1/2 inch. At the completion of the installation, if any heads are found to exceed the above-mentioned tolerance, such heads shall be removed and satisfactorily reinstalled. In areas with ceiling tiles, sprinklers shall be installed in center of tiles.
- B. Locate pipe and sprinkler heads fully coordinated with the engineered diffusers, reflected ceiling plans, ducts, conduits, light fixtures, curtain tracks and all other ceiling elements. Maintain proper code clearances from all ceiling obstructions.

3.2 GENERAL INSTALLATION

- A. Light fixtures and other potential obstructions shall not interfere with the engineered spray patterns of sprinkler heads.
- B. Supervisory Switches: For each indicating valve, sprinkler system riser, sprinkler zone, standpipe system riser, main service entrance, and control valve provide a supervisory switch that is connected to the fire alarm system. Standpipe hose valves and test and drain valves shall not be provided with supervisory switches.
- C. Water flow Switches: For each sprinkler zone, each standpipe riser and where indicated on drawings, provide a water flow switch. Install water flow switch and adjacent valves in easily accessible locations.
- D. System valves and gauges shall be accessible for operation, inspection, tests; and maintenance.
- E. No valve and no piece of equipment or trim shall support the weight of any pipe.
- F. Provide a pressure gauge on the system side of all control valves, at the top of each sprinkler or standpipe riser.
- G. No cutting, drilling or taping of structural members shall be done without prior written approval of the Owner Representative.
- H. Powder actuated fastening will not be allowed. Embeds, beam clamps, or drilled fasteners will be required, unless otherwise noted.
- I. Provide hydraulic design information signage as required by NFPA 13 and 14.
- J. Install access doors in ceilings of rooms where above ceiling access is required.
- K. Prepare all piping having welds for Fire Marshal inspection prior to installation.

3.3 PIPING INSTALLATION

- A. Carry all exposed and concealed horizontal lines of pipe on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction.
- B. Check all piping runs beforehand with all other trades. Run piping to maintain proper clearance for maintenance and to clear opening in exposed area. Run piping in strict coordination with mechanical piping, ducts, and equipment, plumbing work, all electrical conduit and equipment, structural, and architectural conditions. All piping shall be installed within designated finished ceiling height as noted on the architectural drawings.

- C. Install all exposed piping to or at right angles with building walls and tight to walls or ceilings wherever possible. Piping shall be arranged to form a symmetrical pattern. Horizontal piping shall be supported at intervals not to exceed spacing permitted by NFPA 13 & 14. Vertical risers shall be supported at the base and at each floor level with clamps and hangers.
- D. Provide sleeves wherever pipes are run through walls, footings, and slabs, to allow large enough openings for the passage of the pipe. Set sleeves in forms before concrete is poured. Sleeve size shall be not less than a nominal diameter two inches (2") larger than the nominal diameter of piping three and one-half inch (3-1/2") and smaller, and a nominal diameter four inches (4") larger than the nominal diameter of piping four inches (4") and larger. The space between each pipe and sleeve shall be completely closed by packing with code approved mineral fiber materials with a suitable binder or other approved packing material. Piping through rated walls and floors shall be sealed with UL fire rated fireproof material, all in accordance with Fire Marshal's requirements. Pipes through underground exterior walls shall be sealed watertight. Provide link seal protection at sleeves in underground exterior walls and as noted on the drawings.
- E. Fire stop all pipes penetrating fire rated construction in with specification Section 07 84 13, Penetration Firestopping.
- F. Where exposed pipes pass through walls, ceilings, or floors, provide escutcheon plates in all finished rooms and conspicuous locations. Escutcheon plates must be securely held in position allowing enough clearance to allow for expansion and shall be sufficient size to cover the opening around the pipe.
- G. Support all pipe from the building structure so that there is no apparent deflection in pipe runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Do not support pipe from or brace to ducts, other pipes, conduit, or any materials shown on the Drawings. Piping or equipment shall be immobile and shall not be supported or hung by wire, rope, plumber's tape or blocking of any kind.
- H. Arrange riser and piping to maintain minimum clear width at stairways of forty-four inches (44") and minimum headroom of seven feet six inches (7'-6") for all piping.
- I. Do not run piping through elevator hoist way, machine rooms, machinery spaces and enclosures unless piping is serving these spaces. Branch sprinkler piping serving these spaces shall be provided with a supervised branch shut-off valve and flow switch located at an accessible location outside these spaces. Provide supervisory switch on the branch shut-off valve.
- J. Do not run piping through stairways, vaults, electrical rooms and other electrical or electronic equipment spaces and enclosures unless piping is serving these spaces.
- K. Sprinkler piping shall not be installed within the vertical space above electrical switchboards, panel boards, distribution boards, or battery charging panels (refer to California Electrical Code).
- L. Clean pipe and fittings and keep interiors clean throughout installation. Provide caps on ends of cleaned piping.
- M. Use full pipe lengths; random lengths joined by couplings will not be accepted.
- N. Provide allowance for expansion and contraction of all pipes and for seismic movement.
- O. Provide reducing fittings for all changes in pipe size; provide fittings for all changes in pipe direction. Riser piping shall be installed plumb with offset fittings used where alignment adjustment is necessary.

- P. Provide unions for pipe sizes smaller than two inches (2") and flanged or grooved fittings for sizes two inches (2") and larger to permit.
- Q. Provide dielectric fittings where dissimilar piping materials are joined.
- R. Piping arrangement shall avoid beams, columns, ducts, lighting fixtures, doors, windows, and similar obstructions and openings.
- S. Drains, Test Pipes and Accessories: Provide a drain at the base of risers, drain connection on valved sections, and drains at other locations for complete drainage of the system. Provide valve in drain lines and connect to central drain riser. Discharge riser outside over splash block, indirectly over an approved indirect waste receptor as furnished by plumbing section, or as indicated. The main drain shall be capable of discharge test without allowing water to flow onto the floor. If over an indirect waste receptor, verify that receptor is adequately sized to handle flow discharge rate.
- T. Install auxiliary drain valves for lines in accordance with NFPA 13.
- U. The inspector test valve and piping shall be installed in accordance with NFPA 13, and provided at conveniently accessible locations and shall be supplied from the hydraulically remote point. A sight glass with built-in orifice of the appropriate size shall be installed adjacent to each valve. Discharge shall be to the main or to the outside. Location will permit the valve to be opened wide for sufficient time for testing without causing water damage.
- V. The discharge area for the main drain and inspector's test valve shall be protected with a concrete splash pad to prevent damage to landscaping during periodic testing.

3.4 INSTALLATION OF EXTERIOR FIRE ALARM BELLS

- A. The bell shall be located on the face of the protected building adjacent to the fire department connection with a mounting height of eight feet (8') to ten feet (10') above finish grade. The bell shall be connected to one of the two sets of contacts on the building flow switch, with power supplied from a dedicated 120 VAC circuit other than that supplying power to the building fire alarm control panel, served by emergency or standby power source (if the building is so equipped). All wiring shall be in conduit, concealed in interior locations.

3.5 FLUSHING, TESTING, AND ADJUSTING

- A. Test automatic sprinkler system in accordance with NFPA 13.
- B. Perform tests in the presence of authorities having jurisdiction. Provide required labor, materials, equipment and connections and submit results for review. Repair or replace defective work and pay for restoring or replacing damaged work, due to tests, as directed.
- C. All equipment required for testing, including fittings for additional operating shall be provided by the Contractor.
- D. System Piping Flushing: Underground mains and lead-in connections to system risers shall be completely flushed before connection is made to sprinkler piping. The flushing operation shall be continued for a sufficient time to ensure thorough, cleaning. The minimum flow rate shall be not less than the hydraulically calculated water demand rate of the system including: hose requirements, or a flow necessary to provide a velocity of not less than ten (10) feet per second, or the maximum flow rate available to the system under fire conditions. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA 13 and NFPA 24. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers. While conducting the

flushing operation, the contractor shall exercise care that the water does not create any damage. The contractor shall be responsible for any damage caused by this operation.

- E. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically as required by NFPA 13 but not less than for period of two (2) hours at two-hundred (200) PSIG, or at fifty (50) PSI above maximum static pressure if it is greater than one hundred-fifty (150) PSI. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.
- F. Repair or replace piping system components as required to eliminate leakage.
- G. Water remaining in normally dry piping shall be evacuated at completion of testing.
- H. All water level sensors, alarm and supervisory signals, tanks and automatic valves shall be performance tested.
- I. The inspection, hydrostatic test and flushing of the sprinkler system shall be witnessed by the Authority Having Jurisdiction, and Owner Representative.
- J. Provisions shall be made for the proper disposal of water used for, flushing or testing.
- K. Provide complete adjustment of sensitivity of water flow and supervisory (tamper) switches. Coordinate with Division 28 Contractor.
- L. After the inspection has been approved, the Contractor shall certify in writing the time, date, name and title of the person reviewing the test. This shall also include the description and what portion of the system has been approved.
- M. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job site.
- N. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner Representative and before final payment is made.
- O. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated, all at Contractor's cost. Repairs shall be made with new materials.
- P. No part of any work shall be covered until after it is inspected, tested, and approved.

3.6 INSPECTION

- A. After completion of the fire protection installation and at the start of the guarantee period, execute the National Automatic Sprinkler and Fire Control Association, Inc. standard of Inspection Agreement, at no increase in Contract Sum, calling for four (4) inspections of the sprinkler system during the guarantee year (see "Guarantees"), plus the following maintenance to be performed during the course of the fourth inspection:
 - 1. Operating of all control valves.
 - 2. Lubrication of operating stems of all control valves.
 - 3. Operating of electrical alms.
 - 4. Cleaning of alarm valves.
 - 5. Lubrication of Fire Department hose connection inlets.
 - 6. Main drain test.
- B. Fill out Inspection Agreement in triplicate after each inspection and send copies to the Owner Representative.

3.7 PROTECTION, CARE, AND CLEANING

- A. Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this work and until completion.
- B. During construction, properly cap all lines and equipment nozzles to prevent entrance of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint or other work of other trades by covering it with polyethylene sheets.
- C. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put into operation. All systems of any nature shall be thoroughly cleaned and flushed of all pipe contaminants such as cuttings, filings, lubricant, rust, scale, grease, solder, flux, welding residue, debris, etc. Any piece of equipment or part of any system which malfunctions or is damaged due to failure or neglect on the part of this Division to observe this paragraph shall be repaired or replaced to the satisfaction of the Owner's Representative by and at the total expense of this Contract.
- D. After installation has been completed, clean all systems.
 - 1. Piping and Equipment: Clean exterior thoroughly to remove rust, plaster, cement, and dirt before insulation is applied.
 - 2. Piping and Equipment to Be Painted: Clean exterior of piping, and equipment, exposed in completed structure, removing rust, plaster, cement and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable non-toxic solvents. Touch up primer coat as required.
 - 3. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil, and leave surfaces clean and polished.
 - 4. Chrome or Nickel-Plated Work: Thoroughly polish.
 - 5. Factory Finished Items: Remove grease and oil and leave surfaces clean and polished.
 - 6. All code stamps and nameplates shall be protected from damage and must be and legible before final inspection.

3.8 PAINTING AND IDENTIFICATION

- A. After completion of hydrostatic tests, all system piping exposed to view in or on the building shall be painted in accordance with Section 09 91 00 - Painting.
- B. All valve hand wheels shall be painted red enamel.
- C. Provide pipe, valve, and equipment identification; and signage in accordance with referenced codes and specifications.

3.9 ACCESSIBILITY

- A. The installation of valves, gages, control devices or other specialties requiring reading, adjustment, inspection, repairs, removal or replacement shall be conveniently and accessibly located with reference to the finished building.

3.10 CLOSING IN OF WORK

- A. Do not allow or cause any work to be covered up or enclosed until inspected, tested and approved.

3.11 EMERGENCY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without neither voiding the guarantee bond nor relieving the Contractor of their responsibility during the bonding period.

3.12 CLEANING UP AND REMOVAL OF SCRAP

- A. All trash and scrap shall be cleaned up and removed from the site as the work progresses.

3.13 PRELIMINARY OPERATIONS

- A. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

3.14 TRAINING

- A. Provide instruction to the Owner regarding proper use and operation of the system. Training shall include both classroom and "hands-on" sessions and shall occur after final inspection and testing. Location and timing of the training session is to be arranged with the Owner's Representative.
- B. Two weeks prior to scheduled training dates, furnish the Owner's Representative with six (6) bound copies of complete instructions, including catalog cuts, diagrams, drawings, and other descriptive data covering the proper testing, operation, and maintenance of each type of system installed, and the necessary information for ordering replacement parts. In addition, post one (1) copy of complete instructions at the control panel location.
- C. Session shall include detailed training and instructions covering the necessary and recommended testing, operating, and maintenance procedures for each type of system. Session shall include training and instructions covering the emergency operation procedures for each type of system.

END OF SECTION

08/27/18

SECTION 22 00 00

PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 ANCILLARY GENERAL CONDITIONS

- A. The following shall be ancillary to the General and Special Conditions and Division 1 Specification Sections:
 - 1. Prior to bidding the project, thoroughly examine all construction documents and specifications, survey the existing site conditions, and include all necessary allowances in bid proposal.
 - 2. In case of a discrepancy in the specifications, between the specifications and the drawings, within the drawings, or between work under this section and other sections, the Contractor shall figure the most stringent and most expensive alternate and, after award of contract, secure direction from the Owner's Representative.

1.3 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, materials, testing, tools, equipment, services, and transportation necessary for the completion of all plumbing work as indicated on the drawings and specifications herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner. Work includes, but not limited to the following:
 - 1. Plumbing Fixtures.
 - 2. Soil, waste, and vent piping system including connections to equipment furnished in another section of work, stub-outs, and connections to exterior stub-outs.
 - 3. Storm drainage piping system including roof drains, overflow drains, area drains, insulation of horizontal lines and connections to stub-outs.
 - 4. Indirect waste piping including insulation and connections to equipment furnished in another section of work.
 - 5. Condensate drain piping system including insulation and connections to equipment furnished in another section of work.
 - 6. Domestic hot and cold water piping systems including water heaters, mixing valves, circulating pumps, pipe insulation, connections to equipment furnished in another section of work, and connections to exterior stub-outs.
 - 7. Natural gas piping system including regulators, connections to equipment furnished in another section of work, and service connections.
 - 8. Hangers, anchors, sleeves, metal supports, and channels as required for work under this section including sound isolators where indicated.
 - 9. Piping and valve identification.
 - 10. Furnishing and installation of plumbing fixtures and trim.
 - 11. Final piping connections to all fixtures, equipment, including equipment furnished under other sections.

12. Miscellaneous steel work including floor sleeves, slots, inserts, plates, supports, hangers, etc.
13. Testing, adjusting of completed work, inspections, and instructions.
14. Repair of damage done to premises as a result of this installation and removal of all debris left by those engaged in this installation.
15. Shop drawing, submittals, as-built drawings and operation and maintenance manuals.
16. Permits and connection fees.
17. Flashing and counter flashing.
18. All rigging hoisting, transportation and associated work necessary for placement of all equipment in the final location shown.
19. Concrete coring, cutting and patching as a of this work.
20. Trenching, and compacting for work under this section.
21. Painting of exposed piping and supports in accordance with Section 09 91 00, Painting.

1.4 RELATED WORK ELSEWHERE

- A. Section 07 84 13, Penetration Firestopping.
- B. Section 07 92 00, Sealants.
- C. Section 08 31 13, Access Panels.
- D. Section 09 91 00, Painting.
- E. Section 21 00 00, Fire Protection.
- F. Division 26, Electrical.

1.5 REFERENCE AND STANDARDS

- A. Regulatory compliance: All work performed under this Division shall comply with the latest currently adopted editions of all codes and regulations and all requirements of all Authorities Having Jurisdiction. The following references and standards are hereby made a part of this Section and work shall conform to applicable requirements herein except as otherwise specified herein or shown on the Drawings.
- B. Codes and Standards: Conform to all applicable codes and standards as stated herein and as described in Division 1 of the Specifications, including the following:
 1. American Gas Association (AGA)
 2. American National Standards Institute (ANSI)
 3. Adhesive and Sealant Council (ASC)
 4. American Society of Mechanical Engineers (ASME)
 5. American Society for Testing and Materials (ASTM)
 6. American Society of Civil Engineers (ASCE)
 7. California Building Code (CBC)
 8. California Plumbing Code (CPC)
 9. California Fire Code (CFC)
 10. California Energy Conservation Code, Title 24
 11. State of California Administrative Code (CAC) Titles 8, 17, and 24
 12. California Electrical Code (CEC)
 13. National Electrical Manufacturers Association (NEMA)
 14. National Fire Protection Agency (NFPA)
 15. Underwriters' Laboratories (UL)
 16. Comply with all ADA and California Title 24 requirements for disabled access.

17. Division of State Architect, State of California (DSA)
 18. City Fire Marshal requirements
 19. Comply with the latest edition of all applicable standards, including AWWA, PDI, and OSHA
- C. Minimum requirements: The requirements of these are the minimum that will be allowed unless such requirements are exceeded by applicable codes or regulations, in which the regulatory codes or regulation requirements shall govern.
- D. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted Authorities Having Jurisdiction and from the Owner's Representative.
- 1.6 WORK RESPONSIBILITIES
- A. Site Conditions:
1. Examine all of the drawings and the specifications and survey the existing site conditions.
 2. Resolve all conflicts with code requirements, site conditions, the work of other trades, or other mechanical contractors.
 3. Verify the location of all existing utilities prior to construction and protect from damage.
 4. Pay all costs incurred due to damage of existing utilities or other facilities.
- B. Drawings:
1. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of their work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
 2. The general intent of the design indicated on the drawings shall be followed as closely as possible. Coordinate with architectural, structural, mechanical and electrical drawings and the work of other trades prior to piping and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Owner's Representative for approval. Only when Owner Representative's approval is given, in writing, shall Contractor proceed with installation of the work.
 3. Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the Owner's Representative may permit the installation to remain. However, all costs incurred to revise the contract drawings by the Engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
 4. Bring discrepancies between different drawings, between drawings and actual field conditions or between drawings and specifications, promptly to the attention of the Owner's Representative for decision.
 5. Install pipe with all necessary offsets and to conform to the structure. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, maintain required accessibility, keep openings and passages clear, and satisfy the requirements of the governing codes and standards of good practice. The

locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

6. Clearances and Openings: Contractor shall cooperate and coordinate their work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to their requirements for equipment and installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
7. Contractor shall and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.
8. The architectural drawings and specifications take precedence over the plumbing drawings for location of casework, equipment, lights, diffuser, plumbing fixtures, etc. Contractor shall refer to the drawings, specifications, and review shop drawings for all work, in order to coordinate their work with the other work of the project.
9. All scaled and figured dimensions are approximate and are given for estimate purposes only. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc.
10. Drawings are diagrammatic and size and locations of equipment are generally shown to scale. Make use of data in all Contract Documents, and informational documents, and verify this information against field conditions.
11. As far as possible, the work has been indicated on the drawings in such positions as to suit and accommodate the work of the other trades, but the work as indicated is largely diagrammatic and is shown primarily for clarity. Contractor is responsible for the correct placing of their work and the proper location and connection of their work in relation to the work of other trades.
12. Where apparatus and equipment have been indicated on the drawings, dimensions have been from typical equipment of the class indicated. Carefully check the drawings to see that the equipment will fit into the spaces provided.
13. Where equipment is furnished by another Division or others, verify dimensions and the correct locations of this equipment before proceeding with the rough-in of connections.

C. Responsibility:

1. Be responsible for any cooperative work must be altered due to lack of proper supervision or failure to make proper provision in time. Such changes shall be directly supervised by the Owner's Representative and shall be made to their satisfaction.
2. Provide complete functioning systems and include all labor, materials and associated tools and transportation required for the system to operate safely and satisfactorily.
3. Provide all work indicated on the drawings whether or not mentioned in the specifications.
4. Coordinate the installation of plumbing items with the schedules for work of other trades and other contractors to prevent delays in total work. Assume responsibility for any cooperative work which must be altered due to lack of proper supervision or failure to make proper provisions in time.
5. Notify the Authority Having Jurisdiction when work is ready for inspection.

D. Coordination of Installation:

1. Bring to the Owner Representative's attention prior to installation any conflicts with other trades which will result in unavoidable contact to the equipment, piping, etc., described herein due to inadequate space, etc.

2. Bring to the Owner Representative's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation.
3. Provide written notification to Owner's Representative a minimum of fourteen (14) days prior to a utility shut down.
4. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such closure.
5. Restoration of Damage: Repair or replace, as directed by Owner's Representative, materials and parts of premises which become damaged as result of installation of work of this Division. Remove replaced parts from premises.
6. Where new pipes are to be connected to an existing pipe or a stub provided under another section, verify location, size, elevation and all other information necessary for connection. This verification shall be done at the start of construction. Should there be a problem, contact the IOR and/or Architect immediately to resolve the problem.

1.7 PERMITS, LICENSES AND INSPECTIONS

- A. Obtain and pay for all permits, fees and inspections required by work under this Section.
- B. Inspections: All work shall be regularly inspected by the Authority Having Jurisdiction. Certificates of approval shall be delivered to the Owner's Representative.

1.8 SERVICE CONNECTIONS

- A. Arrange and pay all costs for utilities required to complete work of this section. Connection to all on-site services, payment of service charges, and provision for the installation of temporary utilities are included.
- B. Certain site utilities are to be connected to and/or extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which is to be connected. In event depth of lines is not sufficient to permit connection in manner indicated; Contractor shall obtain direction from the Owner's Representative before proceeding with this work.
- C. Verify that utility company's size their services and meters to suit ultimate demand indicated on the drawings.
- D. Gas Service and Meter Assembly: The Contractor shall arrange with the serving utility company for the installation of new gas service with complete meter assembly of the capacity indicated and in the location as shown on the drawings. All items served with gas shall be operated at full fire and adjusted by the Contractor. In cooperation with Gas Company, make all required adjustments to main gas pressure regulators. The Owner shall pay for all required fees.
- E. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping outside of the building to civil site stub and within the building itself.
- F. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building to civil site stub and within the building itself.
- G. Storm Drain: The Contractor shall be responsible for the storm drain service outside of the building to civil site stub and within the building itself.

1.9 NOISE AND VIBRATION

- A. Cooperate in reducing objectionable noise or vibration. If noise or vibration, as a result of improper installation, occurs in the building, correct these conditions at no cost to the Owner.

1.10 QUALITY ASSURANCE

- A. Qualifications:
 - 1. For the actual installation and testing of work under this section use only thoroughly trained and experienced work personnel completely familiar with the items required and the manufacturer's current methods of installation.
 - 2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill.
 - 3. The execution of the work shall be in strict accordance with the best practice of the trades, the intent of this specification, and all codes and ordinances.
- B. Contractor's Qualifications: A firm with at least five (5) years of successful installation experience on projects with plumbing systems work similar and of comparable size and scope to that required for this project. The installer shall have performed at least five (5) similar projects in the San Francisco Bay Area. Contractor shall be prepared to submit written evidence of the installer's experience.
- C. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- D. All materials and equipment installed as part of this work shall be new and the manufacturer's current model.
- E. Soldering: Soldering of copper tubing shall be done in accordance with the Copper Development Association Copper Tube Handbook Instruction on Joining and Forming Copper Tube, Soldered Joints. Permits for on-site soldering shall be obtained from DSA.
- F. Brazing: Brazing of copper tubing shall be done in accordance with the standards of the American Welding Society or the Copper Development Association. Copper Tube Handbook Instruction On Brazing. Permits for on-site brazing shall be obtained from DSA.
- G. Welded Joints: Weld in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified for the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test. Contractor shall conduct the ANSI qualification test. Permits for on-site welding shall be obtained from DSA.

1.11 PRODUCTS

- A. Products shall be obtained from local suppliers or suppliers with local representation. Items of the same type shall all be purchased from the same supplier.
- B. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.
- D. Protection of Materials:
 - 1. Protect materials, equipment and apparatus provided under this Division from damage, water, dust, or similar impairment, both in storage and installation until

Notice of Completion has been filed. Materials, equipment or apparatus damaged because of improper storage or protection will be rejected and must be removed from site.

2. Cap openings in pipes with manufactured caps or fittings. Do not use taped caps.
3. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

1.12 REVIEW OF CONSTRUCTION

- A. The Owner's Representative may review work at any time.
- B. Advise Owner's Representative fourteen (14) calendar days in advance that work is ready for review at following times:
 1. Prior to backfilling buried work.
 2. Prior to concealment of completed Contract items.
 3. When requirements of Contract have been completed.
 4. Prior to installation of suspended dry wall ceiling.
- C. Do not or conceal work without Owner Representative's consent.
- D. Maintain on job a set of specifications and drawings for use by the Owner's Representative.
- E. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

1.13 SYSTEM ACCEPTANCE

- A. Final Review: Request a final review prior to system acceptance after:
 1. Completion of the installation of all systems required under the Contract Documents.
 2. Submission and acceptance of operating and maintenance data.
 3. Completion of pipe, valve and equipment identification.
 4. Completion of cleaning.
 5. Satisfactory operation of all systems for a period of one (1) week.
- B. Acceptance shall be contingent upon:
 1. Completion of final review and correction of all deficiencies.
 2. Satisfactory completion of the acceptance tests which shall demonstrate compliance with all performance and technical requirements of the Contract Documents.
 3. Submission of as-built drawings.

1.14 DAMAGE BY LEAKS

- A. Contractor shall be responsible for damage to any part of the premises caused by leaks in the pipe or equipment installed under applicable sections for a period of twenty-four (24) months from the date of acceptance of the work by the Owner.

1.15 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 01 33 00 Submittals and as follows:
- B. Submittal Requirements:
1. Submit manufacturer's product brochures for all products. Written descriptions of products are not acceptable. Furnish, all at one time, prior to any installation, submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules. Product submittals shall be bound in a three ring binder, with table of contents and tab set for each system.
 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
 3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
 4. To be valid, all submittals must:
 - a. Identify project name and location, Contractor's, Subcontractor's, supplier's and manufacturer's name, address, and telephone number.
 - b. Include table of contents.
 - c. Identify manufacturer's name and model numbers.
 - d. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
 - e. Include all pertinent construction, installation, performance and technical data.
 - f. Have all product data sheets labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
 - g. Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
 - h. Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, and item numbers.
- C. Product Data:
1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, and accessories. Include certified drawings on major equipment such as water heaters, pumps and tanks.
- D. Submit product data and brochures for, but not limited to the following:
1. Pipe Material, Fittings and All Piping Specialties.
 2. Pipe corrosion protection materials.
 3. Unions, Flanges and Dielectric Isolators.
 4. Pipe Supports and Seismic Bracing.
 5. Escutcheons, Flashing and Sleeves.
 6. Fire stopping, including UL listing system numbers and details.
 7. Pipe Isolation.
 8. Insulation.
 9. Valves (all types), including backflow preventers.
 10. Trap Primer Valves.
 11. Water Hammer Arrestors (Shock Absorbers).
 12. Thermometers and Pressure Gauges.
 13. Drains, Cleanouts and Vent Caps.

14. Access Doors.
15. Pipe and equipment markers, and valve tags.
16. Flexible Connectors and Seismic Joints.
17. Hose Bibbs.
18. Plumbing Fixtures and Trim.
19. Pumps.
20. Expansion Tanks and Storage Tanks.
21. Water Heaters.
22. Mixing Valves.

E. Shop Drawings:

1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be prepared using AutoCAD 2000 software. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, fire protection, and electrical in relation to architectural and structural features. Include minor piping, drains, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, etc. Complete and detailed shop drawings of a scale equal to or larger than the design documents shall be maintained throughout the coordination and construction phase indicating all equipment trades' work clearly. All equipment including piping, etc. shall clearly indicate both top and bottom elevations as well as distances from equipment to established building lines. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.
2. Use of contract documents for shop drawings is not acceptable.
3. Required Drawings: Prepare and submit drawings for all areas and all plumbing work. Scale shall be minimum 1/4" = 1'-0" in mechanical rooms, toilet areas, and a minimum 1/8" = 1'-0" elsewhere.

1.16 SUBSTITUTIONS

- A. Base manufacturer is indicated in the equipment schedules and specifications. In specification, additional acceptable manufacturers may be indicated. Other manufacturers, materials, or methods shall not be used unless approved in writing by the Owner's Representative. The burden of proof as to the equality of any proposed substitute manufacturer, material, or method shall be upon the contractor. Substitutions, shall be submitted as follows:
1. Requests for substitution review and acceptance shall be accomplished by table of comparison listing pertinent features of both specified and proposed materials, such as material of construction, replacement or maintenance access, motor type, horsepower, voltage, phase, service factor. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for specified item shall be placed side by side with product data sheets for the corresponding proposed substitution item within the submittal. In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION". Review of proposed substitutions will not be made until receipt of satisfactory comparison tabulation.
 2. Provide calculations and other detailed data justifying how items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
 3. It shall be the responsibility of the Contractor to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and re-submittal will not be allowed.

4. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
5. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all of the proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
6. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
7. The Owner or their authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Owner or that of their representative shall be final and conclusive.
8. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Owner's Representative. If first proposed product submittal is rejected, Contractor shall submit the first-named or scheduled product.
9. Contractor shall be responsible for all costs and coordination due to the substitution, such as impacts on electrical requirements, weights, openings in slabs and roofs, structural framing, housekeeping pad size, etc.
10. All costs incurred to revise the contract drawings by the Engineer for re-submittal to the building department or Authority Having Jurisdiction, indicating the as-installed condition, shall become the responsibility of the Contractor.

1.17 RECORD DRAWINGS

- A. Record of Job Progress: Keep an accurate dimensional record of the "As-built" locations of all work as required. This record shall be kept up-to-date on prints as the job progresses and shall be available for inspection at all times. In addition, record drawings are to be used by the Owner's Representative for job review and field inspections.
 1. Where enlarged plans are provided in the construction set, contractor markups shall be kept on the enlarged plans.
- B. "As-Built" documentation shall be transmitted to the Owner within ten (10) days after Owner Representative's acceptance of the completed installation. As-built documentation shall include the following (Unless noted elsewhere, furnish number of copies indicated):
 1. Three copies of white bond as-built. One (1) copy of final AutoCAD drawing files shall also be provided on CD disk.
 2. Four (4) sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
 3. Four (4) sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions.
 4. Manufacturer's literature, reports and operation and maintenance data shall be in a labeled three (3) ring binder.
- C. Submit in accordance with Section 01 78 39 - Record Documents.

1.18 OPERATION AND MAINTENANCE DATA

- A. The installing contractor shall provide:

1. All literature and instructions provided by the manufacturer describing proper operation and maintenance of any equipment and devices installed.
- B. Data shall include, but is not limited to the following: list of all equipment with manufacturer's name, model number, local representative, service facilities and normal channel of supply for each item. O&M manuals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Operation and Maintenance to match "Product Submittals".
 1. System Description: Description of start-up and operating procedures.
 2. Controls: Diagrams and description of operating sequence of each system.
 3. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts list with parts numbers. Mark each sheet with identification number and actual installed condition.
 4. Materials and Accessories: Manufacturer's brochures parts lists with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
 5. Certificate of factory tests and code compliance as specified.
 6. Recommend preventive maintenance schedule and procedures.

1.19 GUARANTEE

- A. At completion, furnish the Owner's Representative a written guarantee, in triplicate, that work has been performed in accordance with Drawings and Specifications and to replace or repair, to the satisfaction of the Owner's Representative any portion of the work that fails within the guarantee period after final acceptance provided such failure is due to Also agree to replace or repair, with like any part of the building or equipment installed by other trades but damaged by them in installing their work.
- B. During the guarantee period, make four (4) inspections of the work at six (6)-month intervals after final acceptance to check the performance of systems and correct any guaranteed items. Inspections to be made in the presence of the Owner's Representative.
- C. Guarantee in writing all plumbing work for a period of twenty-four (24) months following date of certificate of final acceptance.
- D. All apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.
- E. All plumbing and electrical apparatus shall operate at full capacity without objectionable noise or vibration.
- F. The plumbing systems shall provide the performance required at standard operating conditions.
- G. Where a manufacturer's guarantee exceeds one (1) year, the longer guarantee/warranty shall govern.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND TRIM

- A. Refer to plumbing fixture schedule in construction documents for fixture specifications.

1. Fixtures and equipment shall be certified by the State Authorities and comply with the efficiency standards and water usage requirements of State and Local Authorities.
- B. General: Provide factory fabricated fixtures of type, style and material indicated.
1. Plumbing Fittings, trim and accessories:
 - a. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves or dispensing devices of type and size indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems. Stop valves shall be provided at each fixture.
 - b. Vacuum Breakers: provide with flush valves and water outlets equipped for hose attachment.
 2. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting seam marks, roller marks, foundry sand holes, stains, discoloration or other imperfections on finished units are not acceptable.
 3. Where piping, fittings, trim and accessories are exposed or semi-exposed provide bright chrome plated or polished stainless steel units. Provide copper or brass where not exposed.
 4. Escutcheons: Where fixture supplies and drains penetrate walls, provide chrome plated brass escutcheons. Provide box style escutcheons for p-trap penetrations.
 5. Stainless steel fixtures conforming to ANSI A112.19.3M. Type 302/304, hardest workable temper. Finish shall be No., 4, bright, directional polish on exposed surfaces, or as indicated.
 6. Vitreous China: White vitreous china unless otherwise noted. Fixtures conforming to ANSI A1 High quality, from fire cracks, spots, blisters, pinholes and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ASTM C-554.
 7. Traps: Lavatory and sink p-traps shall be commercial grade, chrome plated cast brass body with cleanout, with 17-gauge brass adjustable wall bend, cast brass nipple, 17-gauge tube, and cast brass slip nuts. No reducing washers allowed. Trap shall be provided with forged brass with brass box style escutcheon. Traps to have a 2" water seal and rough-in complete. Trap adapter extensions are not allowed. Trap shall be by CSA or other recognized testing authority and bear manufacturers name. Brasscraft Commercial, McGuire, or Zurn Commercial.
 8. Lavatory and sink water supply shall be heavy duty commercial grade and include chrome plated all-brass stops with all-brass stem (no plastic stems allowed) and loose-key handle. Kits shall have chrome plated flexible copper risers and deep forged brass with setscrew flange, and have EPDM washers. Inlet shall be IPS with chrome plated nipple. Supply riser lengths to conform to fixture manufacturers recommended rough-in dimensions. Outlets shall be compression. Stops shall be certified to 200psi line pressure. Supply kit shall be certified by CSA or other recognized testing authority, bare manufacturers name and comply with the SDWA (Safe Water Act) "No Lead" restrictions AB1953. Supply kits shall be Brasscraft Commercial, McGuire, or Zurn Commercial.
 9. Lavatory grid drains to have chrome plated cast brass strainer (with overflow for lavatories with overflow drains) with brass lock nut. Drain tailpiece shall be seamless brass tube and a 6" long. Provide offset type for ADA accessible fixtures. Grid drain shall be certified by CSA or other recognized testing authority. Drain body shall bear manufacturers name so as to be visible after installation.
 10. Product submittals for p-traps and lavatory grid drains shall include documentation that product is CSA listed or other recognized testing authority.
 11. Water Connections: Shall have rigid metal to metal connections. Slip joints utilizing non-metallic washers are not permitted. All fixtures shall have stops or valves. All stops shall be lock-shield type, unless otherwise noted.
 12. Provide Schedule 40 red brass nipples at copper lines serving fixtures. Galvanized nipples are not allowed.
 13. Fixture Supports:

- a. Carriers: Fixture supports for all off-floor plumbing fixtures conforming to ANSI A1. Provide floor mounted commercial grade cast-iron supports for fixtures of either graphitic gray iron, ductile iron, malleable iron, or steel as indicated. Carriers for water closets shall be rated to support loads of up to 500 lbs. Submittals indicate that water closet carriers can meet this requirement. Provide cast iron nipples and couplings for water closets and urinals. ABS is not acceptable. Carriers shall be manufactured by J.R. Smith or Zurn.
 - b. Backing: For fixtures other than those specified or required to be furnished with carriers, 1-1/4" x 6" wide steel flat plate welded to steel studs or secured to brick or concrete, drilled and tapped to match hanger. Also install backing where bottom of fixture meets wall. Bolt fixtures to backing through holes in fixture casting.
- 14. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- 15. Flush Valve Supports: All flush valves shall be installed to prevent movement. Supply pipe serving flush valves shall be installed with Holdrite #102-26 flush valve support (#114-C for wall mounted water closets). Supply pipe to be soldered to the support.
- 16. Accessible Fixtures:
 - a. All exposed lavatory and sink trim under the fixture on wheelchair accessible fixtures shall be covered with a white anti-microbial vinyl insulating outer shell. Material shall be flame retardant and fungal and bacterial resistant. Insulating kits shall include covers for drain tailpiece, drain offsets, all p-trap components and hot and cold water supplies including supply risers. Insulation kits shall be Truebro Lav Guard 2, or equal.
 - b. Shall meet the requirements of the Americans with Disabilities Act (ADA).

2.2 STORM, SOIL, WASTE & VENT PIPING SYSTEMS

- A. Above and Below Ground: No-hub cast iron soil pipe and fittings manufactured from gray cast iron with a tensile strength of not less than 21,000 psi, bituminous coated interior and exterior, conforming to the requirements of ASTM A888 and CISPI Standard 301. Each length of pipe shall be hydrostatically (water) tested by the manufacturer to verify compliance. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF international. All pipe and fittings shall be of the same manufacturer.
- B. No Hub Couplings:
 - 1. Above Ground: No-hub couplings shall comply with CISPI 310 and bear the NSF trademark. No-Hub couplings shall be constructed of Type 304 stainless steel with 305 stainless steel worm drive screws. The worm drive clamps shall have a hexagon head to accept a 3/8 inch socketed torque wrench. The clamps shall be tightened to a minimum of 80 inch pounds. (Single corrugated shield, 4 band 80 inch pound torque or 2 band 80 inch pound torque minimum). The gasket material shall be neoprene rubber meeting the requirements of ASTM C-564. Submittal to include copy of compliance to the requirements of FM 1680 Class I by certified independent third party testing laboratory. No-Hub couplings shall be Husky SD2000 or Clamp-All High Torq 80. No coupling reducing fittings allowed.
 - 2. Below Ground: No-hub couplings shall comply with CISPI 310 and all requirements of Factory Mutual 1680 Class I, 15 PSI rated pressure. No-Hub couplings shall be constructed of Type 304 stainless steel with 305 stainless steel worm drive screws. The worm drive clamps shall have a hexagon head to accept a 3/8 inch socketed torque wrench. The clamps shall be tightened to a minimum of 80 inch pounds. (Single corrugated shield, 4 band 80 inch pound torque or 2 band 125 inch pound torque minimum). The gasket material shall be neoprene rubber meeting the requirements of ASTM C-564. Submittal to include copy of compliance to the

requirements of FM 1680 Class I by certified independent third party testing laboratory. No-Hub couplings shall be Husky SD4000 or Clamp-All High Torq 125. No coupling reducing fittings allowed.

2.3 DOMESTIC HOT AND COLD WATER PIPING SYSTEMS

A. Above Ground:

1. Copper Tube: Type 'L', hard-drawn temper, ASTM copper tubing with ANSI B16.22 wrought copper sweat type fittings. Pipe shall be NSF 61 Certified and bear the NSF Certification mark. Submittal to include that pipe is NSF 61 certified.
2. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver. Engelhard 100, or equal.
3. Mechanically formed tee fittings are not acceptable.
4. Fittings: Wrought copper or cast brass solder sweat type.

B. Below Ground:

1. Tube Size 3" and Smaller: Copper tube; Type "K", hard-drawn temper; wrought-copper fittings, brazed-joints, long radius elbows. Pipe shall be NSF 61 Certified and bear the NSF Certification mark. Submittal to include documentation that pipe is NSF 61 certified.
2. Piping below building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.
3. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver. Engelhard 100, or equal.
4. Trap primer: use plastic-coated tube, Streamline 'PlumbShield' or equal plastic coated Type K tubing. Comply with manufacturer's installation instructions.
5. Provide concrete thrust blocks at all changes in direction, changes in size, stops and dead ends, and at valves where thrusts may be expected.

2.4 CONDENSATE PIPING SYSTEMS

- A. Copper Tube: Type 'M', hard-drawn temper, ASTM copper tubing with ANSI B16.22 wrought copper sweat type fittings. Pipe shall be NSF 61 Certified and bear the NSF Certification mark. Submittal to include that pipe is NSF 61 certified.
- B. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver. Engelhard 100, or equal.
- C. Schedule 80 CPVC DWV piping and fittings installed per ASTM F439.
- D. For all high efficiency condensing equipment: Schedule 40 PVC upstream of Heat Transfer Products model N110 inline condensate neutralizer and type "M" copper downstream. Neutralizer to be located at equipment condensate drain outlet.
- E. For connections to equipment on vibration isolators provide flexible connector after trap.

2.5 INDIRECT WASTE PIPING SYSTEMS

- A. Pipe size 1" and smaller: ASTM B88 DWV copper pipe and fittings.
- B. Pipe size 1-1/4" and larger: ASTM B306 DWV copper pipe and fittings.
- C. Solder for Copper Piping: Lead-free, antimony-free, cadmium-free, non-toxic solder, 95.5% tin, 4% copper and 0.5% silver Engelhard Silvacore 100, or equal.

2.6 NATURAL GAS PIPING

A. Natural Gas Piping Above Ground:

1. Piping 2" and smaller: ASTM A53 schedule 40 black steel pipe with ANSI 150 lb. ANSI B16.3 malleable iron screwed fittings.
2. Piping 2-1/2" and larger: ASTM A53 schedule 40 black steel pipe with ANSI B16.9 standard weight, butt type welded fittings.
3. Exposed to weather: Galvanized steel pipe and fittings.
4. All exposed threads shall be primed with one coat of rust inhibiting paint.

B. Natural Gas Piping Below Ground: Underground gas piping shall be 40 SDR-Polyethylene (Yellow) as manufactured by Plexco, or equal. Fittings shall be socket or heat fusion weld Polyethylene as manufactured by Plexco, Central, or equal.

1. Pipe shall be manufactured, tested and marked in strict conformance with the requirements of the following:
 - a. Plastic pipe: ASTM D 25 13,
 - b. Plastic pipe, fittings: ASTM D 1248 and D 3350 for a PE 2406 material.
2. Transition fittings: I.P.S. schedule 40 steel x I.P.S., SDR-11 P.E.2406, polyethylene, with epoxy coating on the steel section and steel' end beveled for welding. Approximately 24 inches long with tamperproof, gas tight, mechanical seal, internally reinforced, at the midpoint.

C. Secondary Containment Pipe: The secondary containment piping system shall be +GF+ Contain-It, as manufactured by Georg Fischer Sloane Inc. **NO SUBSTITUTION WILL BE ACCEPTED.** The piping system shall consist of clear unpigmented Polyvinyl Chloride pipe and fittings. The pipe shall be either solid or longitudinally split. The fittings shall be manufactured in two equal halves. The pipe shall align via tongue and groove construction. The pipe and fitting joints shall be welded together via the George Fischer Injection Bonding Process. Prior to injection bonding, the fittings shall be held together by the clips provided. The clips shall be affixed over the integral fitting clip locators. Final containment inspection shall be accomplished via low pressure air per manufacturer's recommendation. After test, remove any plugs installed on the vent side so the system can be vented to the roof. This is a non-pressure system and shall be vented through the roof. **CONTRACTOR TO CALL W & R INDUSTRIAL PRODUCTS, INC. (925) 602-9700 FOR INSTRUCTIONS FOR THE INSTALLATION OF CONTAIN-IT.**

2.7 DRAINS

- A. Conforming to ANSI A1.
- B. Coated cast iron body, except as noted, with integral double drainage flange, weep holes and inside caulked bottom or no-hub outlet.
- C. Provide cast iron P-trap at all floor drains, floor sinks and trench drains. All floor drains to have trap primers.
- D. Coordinate drain, area drain, trench drains, and floor sink rim elevations to be flush with finish floor and at low point of floor.

2.8 TRAP PRIMER VALVES

- A. Corrosion resistant brass containing no springs or diaphragms, activated by a 5 to 10 psi pressure drop, provide with distribution unit where serving 2 to 4 drains, ASSE 1018

certified and Listed with Precision Plumbing Products Model P-1 & P-2 with DU Series distribution unit, or equal.

- B. Provide trap primers for all floor drains including piping floor drain to trap primer valve. Provide shut-off valve upstream of trap primer valve.
- C. When concealed, provide access panel for maintenance or replacement. Use size appropriate for access.

2.9 CLEANOUTS

- A. Conforming to ANSI A112.36.2. Cleanouts shall be manufactured by J.R. Smith or Zurn.
- B. Cast bronze, full size up to four inch.
- C. Floor Cleanouts: J.R. Smith Fig. 4026-U-F-C, coated cast iron adjustable floor cleanout with inside caulk connection, flange with flashing clamp, internal bronze plug, scoriated round nickel bronze cover secure to rim with vandal-resistant screws.
- D. Wall Cleanouts: J.R. Smith fig. 4422C-U and fig. 4532S-U, cast bronze taper thread plugs with stainless steel cover and vandal-resistant screws. Screw length as required meeting installation requirements. Wall cleanouts shall be located a minimum of 18" above finished floor.

2.10 VALVES

- A. General:
 - 1. All valves used for domestic water shall meet the criteria of California AB1953 low lead provisions.
 - 2. Provide all valves of first quality of approved manufacturer, have proper clearances, and be tight at the specified test pressure. Mark on each valve the maker's name or brand, the figure or list number, and the guaranteed working pressure cast on the body and cast or stamped on the bonnet, or provided with other means of easy identification.
 - 3. All valves must be of the product of one manufacturer, except for special application. Figure numbers of manufacturers are listed to indicate the types selected for design, performance and standard of quality and appearance.
 - 4. Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are not available.
 - 5. Sizes: Same size as upstream pipe, unless otherwise indicated.
 - 6. Operators:
 - a. Hand wheels fastened to valve stem for all valves other than quarter turn.
 - b. Lever handles on quarter-turn valves, 6 inch and 8 inch and larger gear operated, except for plug valves. Provide plug valves with square heads and operating wrench. Provide gear operator for valves 8 inch or larger.
 - 7. Extended stems: Where insulation is indicated, or specified, provide extended stems arranged to receive insulation.
 - 8. End Connection: Valves 2" and under shall be sweat or threaded 2-1/2" and larger shall be flanged or full lug style.
 - 9. Figure numbers of manufacturers are listed to indicate the types selected for design, performance and standard of quality and appearance.

- B. Ball Valves: MSS SP-110; rated for 150 psi saturated steam pressure, 600 psi WOG pressure; full port, two or three-piece bronze body construction, chrome plated solid bronze ball, blowout proof stem, reinforced "Teflon" seat and seals, separate adjustable packing gland and nut, and vinyl covered steel handle. Provide locking type handle where required.
1. Valves 2" and Smaller: Nibco T/S-685-80-LF, Watts Series LFB6080/LFB6081 or equal.
 2. Valves 2-1/2" and Larger: Use butterfly valve.
- C. Butterfly Valves: MSS SP-67; rated at 200 psi, body conforming to ASTM A 126, Class B. Provide full lug style valves with field replaceable EPDM phenolic backed sleeve, aluminum bronze disc, stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks.
1. Nibco LD-2000, Watts Model BF03-121-45/BF03-121-4G or equal.
- D. Check Valves:
1. Swing Check Valves: 2" and Smaller: MSS SP-80; Class 125, 200 psi WOG, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc. Provide valves capable of being refitted while the valve remains in the line.
 - a. Nibco T/S-413-Y-LF or equal.
 2. Swing Check Valves: 2-1/2" and Larger: MSS SP-71; Class 125, 200 psi WOG, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal wing, and bronze disc or cast-iron disc with bronze disc ring, flanged ends. Provide valves capable of being refitted while the valve remains in the line.
 - a. Nibco F-918-N or equal.
 3. Lift Check Valves: 2-Inch and Smaller: Class 125; cast-bronze body and cap conforming to ASTM B 62; horizontal or angle pattern, lift-type valve, with stainless steel spring, bronze disc holder with renewable "Teflon" disc. Provide valves capable of being refitted and ground while the valve remains in the line.
 - a. Nibco or equal.
 4. Non-Slam Check Valves: Provide non-slam check valves on the discharge of pumps. Check valves to be silent closing, class 125, iron body, bronze mounted spring leaded center guide.
 - a. Valves 2" and Smaller: Nibco T/S-480-Y-LF or equal.
 - b. Valves 2-1/2" and Larger: Nibco F-910-B or equal.
- E. Water Pressure Relief Valves: Provide ASME labeled, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, Wilkins No. P174A, Watts, or equal.
- F. Combination Pressure and Temperature Relief Valves: Provide ASME labeled, adjustable bronze spring and diaphragm combination pressure and temperature type with test lever and automatically reseating type thermostatic element, Relief valve shall be type as recommended by the water heater equipment manufacturer.
- G. Natural Gas Provide AGA/CGA listed gas valves for natural gas piping system.
1. Valves 2" and smaller: MSS SP-110; full port, two-piece body, blowout proof stem, lever handle, screwed ends, 600 psi WOG rated, AGA/CGA/UL listed and FM approved, Red & White #5044 or equal.
 2. Valves 2-1/2" to 6": Provide lubricated plug type, bronze body, standard port, spring balanced plug & stem, 1/4 turn operation, flanged ends, and include operating wrench and locking device, UL/CGA Listed, Homestead #612, or equal.

- H. Balancing Valves: Fully assembled, forged brass body, 304 stainless steel parts, EPDM O-rings, 20 mesh stainless steel strainer, nickel-plated brass ball valve, 400 psi/250°F rated, accessible flow control cartridge, ports for testing, Griswold Isolator "R" Series, or equal.
- I. Gas Regulators: American Meter Company Series 1200, 1800, 1803, and 3000, or equal. Contractor shall size and provide gas regulators based on gas demand, available inlet pressure and required outlet pressure for each application. Provide gas regulator vent line(s) piped to outside, or as indicated on the drawings.
- J. Seismic Gas Shut-Off Valve: 60 psi pressure, manual reset, high flow efficiency with minimal pressure drop, positive closure, soft seat seating, visual open-close indicator, meets 25-97, U.L. and CGA listed, threaded connections for sizes 2" less, flanged connections for sizes greater than 2". Pressure drop not exceed 13' equivalent piping length. Size shall match that of gas piping line size Valve shall meet California Standards for Earthquake Actuated Automatic Gas Shut Off Systems, Standard No. 12-23-1 ANSI 221.70 1981. Valve shall be approved by the State of California State Architect. Valve Pacific Seismic Products earthquake activated automatic shut-off valve, or equal.
- K. Valve Box: Christy B03 reinforced concrete utility box with reinforced concrete lid. Provide steel, checker plate, traffic lids on all paved areas and walkways 5'-0" wide or greater.

2.11 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

- A. Every effort shall be made by the contractor to alleviate hydraulic shock (water hammer). Should water hammer be present in the final installation and water hammer arrestors have not been installed as noted by this specification and all the authorities named within, it shall be the responsibility of the contractor to provide water hammer arrestors per this specification at no additional cost to the Owner.
- B. Locate and size per Plumbing and Drainage Institute Manual WH-201.
- C. Provide water hammer arrestors in water lines to equipment or fixtures having quick closing valves, flush valves, sensor operated metering faucets, mechanical metering faucets, foot pedal valves, knee operated valves, and any equipment that might produce water hammer.
- D. Water hammer arrestors shall be certified by the Plumbing and Drainage Institute (PDI). Water arrestors shall have threaded stainless steel casing, partially filled with liquid and charged with gas as required for line pressure, stainless steel or neoprene bellows, J.R. Smith "Hydrotrol" or Zurn "Shocktrol".
- E. When concealed, provide access panel for maintenance or replacement. Use size appropriate for access.
- F. Provide 6" brass nipple at connections to copper lines.

2.12 CORROSION PROTECTION

- A. All buried copper and steel piping and fittings shall be cleaned, primed then protected by wrapping.
 - 1. Piping 3" and smaller: Prime pipe and machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Hand wrap fittings using 100% overlap wrap extending 6" beyond fitting onto wrapped pipe. Comply with tape manufacturer's installation instructions. Wrap pipe with 3M "Scotchrap 51" corrosion protection tape (20 mils thick) and pipe primer, or equal.
 - 2. Piping 4" and larger: Encase in 8 mil polyethylene tube encasements in accordance with ANSI/AWWA A21.5/C105 and manufacturer's instructions.

3. All below ground metallic fittings, valves, flanges, bolts, shall be protected against corrosion as follows:
 - a. All metallic components as described above shall receive a heavy coating of "Henry's" oil base roof mastic, or equal.
 - b. After mastic coating is completed and inspected, wrap entire metallic component with a minimum of 10 mils. polyethylene wrap as manufactured by Visqueen or equal, overlapped 50% of the circumference and extended beyond ends of component as required for polyethylene to be secured to piping. The overlap seam shall be located to avoid material from entering the encapsulate area. The ends and seam of the of the polyethylene material shall be secured to the piping and sealed with 3M "Scotchrap 51" corrosion protection tape (20 mils thick) and pipe primer, and 2" wide pipe wrap sealing tape.
 - c. The mastic coating shall be inspected and approved prior to the finish application of the polyethylene material, which shall also be inspected.

2.13 PIPE SUPPORTS, ANCHORS, AND HANGERS

- A. Unless detailed on the drawings, all piping shall be supported with, B-Line, Grinnell, Super Strut, Tolco, or equal, pipe hangers and supports. All hangers and supports furnished for this installation shall be of one manufacturer. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide felt lined hangers for copper piping systems.
- B. Special pipe supports for piping in equipment and other locations where shown on drawings shall be constructed as detailed on drawings. Unless otherwise shown on drawings, support channels, frames, brackets, and legs of special supports shall be made of B-Line, Grinnell, Super Strut, Tolco, Unistrut, or equal channels, attaching clips, pipe clamps, and other required accessories. Piping installed within partitions and connected to plumbing fixture trim shall be securely attached to adjustable stud brackets, not more than 2-feet away from and on the inside of wall penetration.
- C. Hanger Rods: Hanger rod size shall be no less than the standard rod sizes listed on the MSSSP-69. Rods shall be steel rods, threaded at ends only with a minimum safety factor of 5 over the imposed load, Tolco Fig. 103, or equal. All thread rods are not acceptable. Provide rod stiffeners as required.
- D. Where beam clamps are used, provide beam clamp retaining strap.
- E. Powder-driven and explosive type fasteners are not allowed.
- F. Equipment Support Members: Install AISC steel beams to accommodate support for pipe and equipment from above when it is not practical to install concrete anchors.
- G. No metallic pipes shall have metal-to-metal contact with hangers, clamps, brackets, or any other pipe support, or be otherwise in direct contact with any part of the building structure.
- H. Finish of all pipe supports attachments, rods, hangers, etc., shall be galvanized or cadmium plated.
- I. Steel for Equipment Support: Support steel shall be of new material conforming to ASTM A36, latest edition. Brackets, supports, etc., fabricated from ferrous metal shall be hot dipped galvanized after fabrication. Steel hangers shall have a safety factor of 4.0 or greater.
- J. Miscellaneous Steel, Bolts, Nuts, Washers, Etc.: Miscellaneous steel angles, channels, brackets, rods, clamps, etc., shall be of new materials conforming to ASTM A36. All steel parts exposed to weather or where noted shall be hot dipped galvanized after fabrication.

- K. All bolts and nuts, except as otherwise specified, shall to ASTM "Standard Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners", Designation A307. Bolts shall have heavy hexagon heads, and nuts shall be of the hexagon heavy series. All bolts, washers, nuts, anchor bolts, screws and other hardware, unless otherwise specified, shall be galvanized, and all galvanized nuts shall have a free running fit. Bolts shall be of ample size and strength for the purpose intended.
- L. Concrete Anchors:
 - 1. For New Concrete Slabs with Metal Decking: B-Line, Hilti, Red Head, or equal, steel deck inserts or wedge type expansion anchors.
 - 2. For New Concrete Floor or Base: B-Line, Hilti, Red Head, or equal, hook bolts, wedge type expansion anchors, or Deco adjustable concrete anchors.
 - 3. For Existing Concrete Slabs: B-Line, Hilti, Red Head, or equal, self-drilling concrete anchors. Locate anchors to clear rebar.
 - 4. Maximum loading on inserts and rods shall not exceed 75 percent of ratings.
 - 5. Powder actuated fastening systems will not be allowed.
- M. Insulated pipes shall be supported with Pipe-Shield, Inc., Model "CS-CW" unless otherwise noted, or equal, pipe hanger shield with waterproofed calcium silicate insulation encased in a galvanized-sheet metal shield completely around the pipe. Shield shall be 26 gauge for pipes up to 1", 22 gauge for 1-1/4" and 1-1/2", 20 gauge for 2" to 8" in size, and 16 gauge for 10" and larger. Insulation shall be same thickness as pipe insulation.

2.14 SEISMIC RESTRAINTS

- A. General Requirements: Seismic restraints shall be provided for all vibration isolated equipment, both supported and suspended, and all vibration isolated piping.
- B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the mechanical engineer and the DSA Field Engineer.
- C. All mechanical equipment shall be braced or anchorage to resist horizontal force acting in any direction using the following criteria:
 - 1. The total design lateral seismic force shall be determined from ASCE 7 Section 13.3.1, California Building Code (CBC) 2016. Forces shall be applied in their horizontal directions, which result in the most critical loadings for design. The value of a_p (component amplification factor) and R_p (component of modification factor) of Section 13.3.1 shall be selected from Table 13.6-1, ASCE 7. The value of I_p (seismic importance factor) and S_{DS} (special acceleration) shall be selected from Section 13.1.3 and Section 11.4.4, ASCE 7, respectively.
- D. For Supported Equipment:
 - 1. Pre-approved isolator restraint system by the State of California and bear approval number.
 - 2. Submittal shall include load versus deflection curves up to 1/2" in the x, y, and z planes. Tests shall be conducted in an independent laboratory or under the signed supervision of an independent registered engineer. The snubber assemblies shall be bolted to the test machine as the snubber is normally installed. Test reports shall certify that neither the bridge bearing neoprene elements nor the snubber body has sustained any obvious deformation after release from the load.
 - 3. Submit calculations for each seismic restraint and vibration isolation signed by structural Registered Engineer.
- E. Seismic Restraint Systems for Piping:

1. All seismic bracing required shall be installed as per Chapter 13 of ASCE 7-10 except as modified by Section 1615A of the 2016 CBC.
2. Piping distribution systems shall be braced to resist forces prescribed in ASCE 7-10 Section 13.6.7 and 13.6.8 respectively.
3. The bracing and attachments to the structure shall comply with one of the OSPD Pre-Approvals with OPA #, such as B-Line (OPA 0114), Mason Industries (OPA 349), ISAT (OPA 485) as modified to satisfy anchorage requirements of ACI 318 D.
4. Copies of the manual shall be on the jobsite prior to starting hanging and bracing of the pipe distribution systems.

2.15 PIPE ISOLATION

- A. All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line "Vibra Clamp" and "Vibra Cushion", Super Strut, "Trisolator", or equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.
- B. Provide pipe and sound isolation for all piping through walls, Acoustoplumb by LSP Products, Holdrite Silencer by Hubbard Enterprises, or equal.

2.16 PIPE INSULATION

- A. General: Conform to NFPA Section 90A, with special regard to the fire hazard requirements of ASTM E84 and NFPA No. 255, latest revision, including vapor barriers and adhesive. All insulation shall be UL listed and shall meet all code requirements, minimum California State Energy Code Title 24. Insulation shall be Owens Corning, Johns-Manville, or equal.
- B. Fire Hazard Rating: Insulation, jackets, facings, adhesives, coatings, and accessories shall be acceptable to the Fire Marshal, and shall not exceed the following fire hazard classifications: Flame-spread: Maximum 25, Fuel Contributed: Maximum 50, Smoke Developed: Maximum 50. Rating to be in accordance with UL Test Method for Fire Hazard Classification of Building Materials, No. 763.
- C. Domestic Cold, Hot Water, Hot Water Return: Fiberglass, Heavy Duty 25ASJ/SSL, heavy density, UL listed non-combustible fiberglass segmented pipe insulation with an integral vapor barrier jacket. The jacket shall have a pressure sealing lap adhesive. Insulation density shall be between 4 and 7 PCF. Insulate cold water piping in concealed areas and warm (heated) areas with minimum insulation. Insulate exterior cold water piping with 1" insulation. Insulation for hot water shall comply with California Title 24 requirements. Required thickness shall be a function of the pipe size as indicated below.
- D. Indoor Piping -Fluid Temperature Range (105°F and Above):

Pipe Diameter	Insulation Thickness
1" and smaller	1"
Up to and including 2"	1.5"
2-1/2" and larger	1.5"

- E. Outdoor Piping -Fluid Temperature Range (105°F and Above):

Pipe Diameter	Insulation Thickness
1" and smaller	1"

Up to and including 1"	1.5"
1-1/4" and larger	2"

- F. Condensate Drain, Storm Drain and Overflow Drain: Fiberglass, Heavy Duty 25ASJ/SSL, heavy density, UL listed non-combustible fiberglass segmented pipe insulation with an integral vapor barrier jacket. The jacket shall have a pressure sealing lap adhesive. Insulation density shall be between 4 and 7 PCF. Insulate horizontal storm drain and overflow drain lines, elbows up to roof drain body, and roof drain bowls with a 1" thick insulation. Insulate all condensate drains with a minimum of 1/2" thick insulation.
- G. Insulate fittings, valves, joints, expansion joints, and couplings with insulation of same material and thickness as adjoining pipe. Use pre-molded fiberglass covers or radical mitered segments of pipe insulation. For valves, expansion joints, fittings and accessories requiring servicing or inspection, insulation shall be removable and replaceable without damage. Enclose within two-piece no. 15 gauge aluminum covers fastened with cadmium-plated bolts and nuts. Concealed items shall be labeled. Unions and flanges, strainers, air chambers and water arrestors, need not be insulated.
- H. All insulation shall be continuous through walls, sleeves, pipe supports and hangers, and other pipe penetrations.
- I. Finish insulation at supports, protrusions and interruptions. No hangers or supports shall be embedded in insulation.
- J. For exterior applications and piping exposed to weather, provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover piping and all fittings with 0.016" aluminum or stainless steel jacket (meeting ASTM B209) with moisture barrier, and with two 318" wide 0.015" thick aluminum or 0.010" thick stainless steel bands per 3 feet section (18" on center), completely watertight. Lap all joints 2" minimum and seal per manufacturer's recommendations. Locate seams on the bottom side of horizontal piping.
- K. All insulated piping drops exposed in finished areas shall be jacketed in stainless steel jacket, secured and sealed around pipe to prevent entrance of water during cleaning process.
- L. Insulated pipes shall be supported with Pipe-Shield, Inc., Series A-9000, or equal, pipe hanger shield with waterproofed calcium silicate insulation encased in a galvanized sheet metal shield completely around the pipe. Shield shall be 26 gauge for pipes up to 1-1/2", 22 gauge for 2", 20 gauge for 2-1/2" to 8" in size, and 16 gauge for 10" and larger. Insulation shall be same thickness as pipe insulation. Provide calcium silicate insulation with insulation protection saddles and shields at pipe hangers. Insert sections shall be installed on all insulated piping located centrally under each hanger where the insulation rests on hanger. Vapor barriers and jacketing continuous over insert.

2.17 ESCUTCHEONS, FLASHINGS AND SLEEVES

- A. Provide sleeves for each pipe passing through footings, foundations, walls, partitions, floors, roofs and other locations where needed, whether shown or not.
- B. Piping penetrating below grade exterior walls and floors, and floors in all food service areas including pantries, shall be sleeved and made watertight using Thunderline "Link Seal" sealer, or equal.
- C. Sheet metal pipe sleeves: Fabricate from galvanized sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the

following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge. Adjustocrete, Sleevecrete, or equal.

- D. Set all pipe sleeves and inserts in place before concrete is poured. Coordinate the placing of these items to avoid delaying concrete placing operations.
- E. Sleeves for insulated piping shall be of adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking. Provide galvanized steel pipe sleeve, minimum 18 gauge, sized for maximum 1 inch space between insulation and sleeve. Omit specified insulation and apply same thickness of UL approved insulation through thickness of wall and extending 1" either side. Provide UL rated ceramic fiber packing. Pack space between sleeve and insulation with packing and seal ends with approved seal. Seal shall be positively fastened using metal plates, or escutcheons. Commercial pipe sleeve assemblies which are UL rated and which have been approved by the fire marshal for this purpose shall be used. Pipe Shields Inc. F1000 series or equal. Use only assemblies which have been designed for the service on which they are to be used.
- F. Caulk space between sleeve and pipe or pipe covering through rated walls, partitions, and floors with fire rated, incombustible, UL listed, permanently plastic, waterproof non-staining compound leaving a finished, smooth appearance. Fire stopping shall be in accordance with specification Section 07 84 13, Penetration Firestopping. Provide supporting backing to secure material in place.
- G. Provide sleeves as follows:

SLEEVE LOCATION	SLEEVE MATERIAL
Interior Wall, Partitions	Galvanized sheet metal
Membrane Waterproof Floor and Roof Construction	Standard weight black steel pipe with flashing clamp device welded or threaded to pipe sleeve. Flashing clamp device J.R. Smith 1720 or equal by Zurn
Non-membrane Floor Construction	Standard weight black steel pipe
Footings and Foundations	Schedule 40 galvanized steel pipe
Exterior Walls	Standard weight galvanized steel pipe with a continuously welded water stop of 1/4" steel plate extending from outside of sleeve a minimum of 2" all around

- H. Escutcheons, Finish and Plates:
1. Smooth up rough edges around sleeve with plaster.
 2. Provide escutcheon plates where exposed pipes pass through walls, ceilings, or floors, in all finished rooms and conspicuous locations. Provide chrome or nickel plated plates sized to fit pipe and pipe covering and give a finished appearance. Escutcheons held in place by set screws allowing enough clearance to care for expansion and shall be sufficient size to cover the opening around the pipe. Provide plates on pipes extending through sleeves.

2.18 THERMOMETERS

- A. Type: Weksler Fill", or equal, industrial, green reading mercury glass tube, 9" cast of extruded case, double strength glass window, adjustable angle, stainless steel bulb chamber, brass extended separable socket. Provide stainless steel protected shield for outside application. Install for easy reading from floor with clear sight line.
 - 1. Domestic Cold Water: Range of 0-120°F.
 - 2. Domestic Hot Water: Range of 30 -240°F.
- B. Separable Sockets: Brass 150 psi at with 2%" extension necks. Install vertically in runs of pipe.
- C. Thermometer Wells: Install in piping for all thermometers. Construct to withstand pressure, temperature, and fluid in which installed with extension necks. Install vertically in horizontal runs of pipe.
- D. For thermometers and wells through insulation, provide extensions to compensate for insulation thickness.

2.19 PRESSURE GAUGES

- A. Weksler, or equal, drawn steel or brass case, glass lens, 4-1/2" dial, 1% accuracy, ANSI B40.1 Grade 2A, phosphor bronze, bourdon tube, brass bottom connection.
 - 1. Scale: White coated aluminum with permanently etched markings, black graduations and numerals, 270° arc scale.
 - 2. Range: Dial range approximately twice the working pressure.
- B. Provide pressure gauge cocks between pressure gauges and gauge tees on piping system.

2.20 VENT THROUGH ROOF

- A. Provide Stoneman No. 1100-5, one (1) piece, four (4) pound, series with reinforcing steel boot counter-flashed with cast iron flashing sleeve and equipped with vandal-proof hood for all vent piping. Seal joint between flashing and pipe with waterproofing compound.
- B. All vents through roof shall be provided with vent caps that have cast iron sleeve and dome secured with recessed Allen key set screws. Vent caps shall be manufactured by J.R. Smith or Zurn.

2.21 ACCESS DOORS AND PANELS

- A. Furnish under this Division where shown and required by Regulatory Agencies for access to all concealed valves, water arrestors, unions, etc. Doors shall be in accordance with requirements of Section 08 31 16. Doors in this Division, Section 08 31 16, and Division 26 shall be from same manufacturer for identical appearance and keying. Sizes: 24" x 24" inches' minimum for ceilings and 12" x 12" minimum for walls. Doors shall be furnished with cylinder locks. Furnish fire rated doors when located in rated construction. Deliver doors for installation under Section 08 31 16. Mark each door to accurately establish its location.

2.22 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. Above ground piping:
 - 1. All piping are to be identified as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, pressure sensitive pipe markers consisting of pipe content wording and

arrow indicating directions of flow on ANSI color background. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other. Provide at each end of each marker, two and one-fourth inch wide self-sticking clear tape around periphery of pipe or insulation to further secure marker. All markers shall be applied to clean surfaces free of dust, grease, oil or any other material which will prevent adhesion. Install after cleaning, painting and insulation is complete. Pipe identification shall comply with ANSI A13.1 for the "Scheme Identification of Piping Systems".

2. Location and visibility for pipe identification:

- a. On all horizontal runs spaced twenty feet (20') maximum but not less than once in each room at entrance and exit of each concealed space.
- b. At each branch and riser takeoff.
- c. Within one foot (1') of each valve and control device.
- d. At every change in directional flow.
- e. At every pipe passage through wall, floor and ceiling construction.
- f. Where capped piping is provided for future connections, provide legible and durable metal tags indicating symbol identification.
- g. At all wall and ceiling access
- h. Near major equipment items and other points of origination and termination.
- i. Attention shall be given to visibility with reference to pipe markings. pipe lines are located above or below the normal line of vision; the lettering be placed below or above the horizontal centerline of the pipe.

3. ANSI Color Coding of Piping:

SERVICE	COLOR OF FIELD	COLOR OF TEXT
Domestic Cold Water	Green	White
Domestic Hot Water	Yellow	Black
Domestic Hot Water Return	Yellow	Black
Natural Gas	Yellow	Black
Sanitary Sewer	Green	White
Sanitary Vent	Green	White
Condensate Drain	Yellow	Black
Storm Drain	Green	White
Storm Drain Overflow	Green	White

4. Size of Legend Letters:

OUTSIDE DIAMETER OF PIPE COVERING	MINIMUM LENGTH OF COLOR FIELD	MINIMUM SIZE OF TEXT
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

5. All exposed water piping and valves downstream of devices shall be properly identified and labeled as "Non-Potable" water.

B. Buried Utility Warning and Identification Tape:

1. All underground piping shall be identified with underground warning pipe markers as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, non-adhesive four (4) mil polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines. Tape shall be of the type provided in rolls, six inches (6") minimum width, color coded for the utility involved, with warning identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification for lines shall be "CAUTION (TYPE OF SERVICE) LINE BURIED BELOW". Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.
2. Run detector tape continuously along pipe and terminate in adjacent valve boxes or other suitable facilities. No splices will be allowed. Locate over buried pipe at twelve inches (12") below finish grade. Protect tape from damage during installation and Tape that is broken, cut or crumpled shall be completely replaced. Install twelve (12") above the top of the respective pipe and twelve (12") below the surface during backfill. Provide detectable type for buried non-metallic pipes.
3. ANSI Color Code of underground tape shall be as follows:

SERVICE	COLOR OF FILED	COLOR OF TEXT
Natural Gas	Yellow	Black
Water	Blue	Black
Sanitary Sewer	Green	Black
Storm Sewer	Green	Black
Electric	Red	Black

C. Valve Identification:

1. All valves shall have brass identification tag as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, brass valve identification tag secured with brass chain and "S" hook. Tags shall bear the service identification and numerical identification of the valve.
2. Engrave identification tags with "normally open" (green) or "normally closed" (red).
3. Tags:
 - a. Minimum two inches (2") square pattern for plumbing and two inches (2") triangle for fire protection.
 - b. No. 18 BS gauge brass with stamped numbers and letters filled in with black enamel paint. Engraving, ink, dye and vinyl fill are not acceptable.
 - c. Identifying number and system letter. Top line shall be 1/4" characters and should abbreviate the service. Example: Hot Water – HW. The second line shall be characters and should list the valve number. Example: 1st floor shall begin 101, second floor begin 201.
 - d. Attach 6"-12" of brass jack chain around bonnet or stem of the valve in a way that it cannot accidentally come off. Attach appropriate size brass "S" hook to the chain in the most conspicuous location. Hang valve tag from the "S" hook. Valve tag should not be attached to the wheel causing interference with valve operation.
 - e. Provide on: All valves and controls.
4. Where shut-off valves are installed on-branch line leading to emergency safety equipment (emergency showers and eyewashes), the valves shall be locked in the open position labeled for identification.

D. Equipment Identification:

1. Provide engraved plastic nameplates on all plumbing equipment, including but not limited to the following: Pumps (all types), water heaters, heat exchangers, and tanks. Provide nameplates on each piece of equipment and at the disconnect, and

the breaker. Nameplates shall conform to the following, provided the equipment accommodate the sizes outlined:

- a. Black background with white lettering.
 - b. Sizes: Equipment 2" x 4", disconnect 1" x 2-1/2", breaker 1" x 3".
 - c. Lettering shall be 3/4" (1/4" minimum) or sized for the maximum per nameplate.
 - d. Nameplate shall be provided with both adhesive backing and screw holes to insure permanent application.
 - e. Material shall be 2 ply 1/16" thick with beveled edges.
2. Properly identify each piece of equipment and controls pertaining thereto by nameplates mounted on equipment and controls using round head brass machine screws, pop rivets or contact cement. Cardholders in any form not acceptable. Install with corrosion resistant mechanical fasteners and adhesive and seal with clear lacquer.
 3. Place warning signs on machines driven by electric motors which are controlled by fully automatic starters, in accordance with Article 3281, General Industry Safety Orders.
 4. Small devices, such as pumps, may be identified with tags.
 5. Identify control panels and major control components outside panels with nameplates.
 6. Identify equipment out of view behind access doors, in unfinished rooms on the face of the access door.
 7. All gas pressure regulators shall be identified with proper signs. The upstream pressure shall be identified with a metal tag permanently attached to the regulator and state (with appropriate wording to state actual gas pressure conditions): 5psig natural gas pressure. DO NOT REMOVE, or similar.
 8. Emergency Safety Equipment: Emergency units shall be with highly visible signs in accordance with ANSI 2358.1 and shall comply with the provisions of ANSI 2535.1 through ANSI 2535.5. Signs shall utilize a white background with green lettering. Graphics and lettering shall be of the correct size and format. Signs shall be furnished by manufacturer of the safety equipment and shall be in accordance with manufacturer's instructions and ANSI standards.
 9. At plumbing fixtures where water exceeding 120 degrees is accessible to users, warning signs with letters at least 2 inches high shall be posted above the fixture. Sign shall have "Danger Hot Water/Tap Symbol" in warning triangle and the words "Danger Hot Water, Use with Caution, Can Cause Severe Burns". Sign shall be approximately 12"high by 8" wide Semi-Rigid PVC and color shall be on White.

E. Valve and Equipment Identification Charts:

F. Provide five typewritten schedules giving numbers, service and locations, and notations of open or closed, of all tagged valves. Enclose each schedule in separate transparent plastic binder. List piping systems with symbol and color coding on pipe identification chart. List valve model numbers and symbol for service corresponding to piping symbol on valve identification chart. Provide small "key plan" identifying valves as related to column lines. Schematic flow diagrams of each piping system indicating:

1. Location and function of each tagged valve.
2. Type, size and essential features of each system.

G. Submit drafts of valve schedule for review before preparing final sets.

H. Frame five copies of reviewed schedule under glass, mount where directed.

I. Provide typewritten list of equipment in triplicate, indicating location, service for each piece of equipment, suitably framed, with glass front.

2.23 STRAINERS

- A. Wye type, with Monel or stainless steel strainer cylinder and gasketed machined strainer cap, bronze body, threaded, 250 pound, C.M. Bailey No. 100-B, or equal.

2.24 FLEXIBLE CONNECTORS

- A. All equipment, either rigidly mounted or mounted on vibration isolators, shall be attached to the piping system using flexible connectors designed for seismic movement. Flexible connectors shall be capable of movement in the $\pm X$, $\pm Y$ and $\pm Z$ planes and must completely isolate the equipment from the piping.
- B. Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings. For potable water service, connectors shall be classified in accordance with 61-1977 standards.
- C. Flexible connectors attached to fuel gas lines, shall be specifically manufactured for gas applications and certified by the American Gas Association.
- D. Flexible connectors shall be flexible corrugated hose and braid, stainless steel, rated, 125psig minimum, 150 lb flange for pipe sizes 2-1/2" and larger and threaded ends for 2" and smaller, as manufactured by The Company, or equal. Provide flexible metal hose assembly as shown on the drawings.

PART 3 - EXECUTION

3.1 DRAWINGS AND SITE

- A. Drawings:
 - 1. All scaled and figured dimensions are approximate and are given for estimate purposes only. Before proceeding with any work, carefully check and verify all dimensions, sizes, lengths, etc.
 - 2. So far as possible the work has been on the drawings in such positions as to suit and accommodate the work of the other trades, but the work as indicated is largely diagrammatic and is shown primarily for clarity. Contractor is responsible for the correct placing of their work and the proper location and connection of work in relation to the work of other trades.
 - 3. Where apparatus and equipment have been indicated on the drawings, dimensions have been taken from typical equipment of the class indicated. Carefully check the drawings to see that the equipment will fit into the spaces provided.
 - 4. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.
 - 5. Contact Owner's Representative before any digging and investigate all existing conditions. Secure permit from Owner's Representative prior to initiation of underground excavation.

3.2 GENERAL PIPING INSTALLATION

- A. Carry all exposed and concealed horizontal lines of pipe on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction. Use trapeze hangers for supporting groups of pipes. Piping in parallel shall be evenly spaced and supported.

- B. Conceal all piping in furred walls and partitions and pipe spaces except where specifically noted otherwise. Check all piping runs beforehand with all other trades. Run piping to maintain proper clearance for maintenance and to clear opening in exposed area. Run piping in strict coordination with mechanical piping, ducts, and equipment, plumbing work, all electrical conduit and equipment, structural, and architectural conditions. Where work of other trades prevents installation of the piping as shown on the Drawings, reroute piping at no extra cost. Verify all inverts in pitched lines before starting work.
- C. Install all exposed piping parallel to or at right angles with building walls and tight to walls or ceilings wherever possible, except where otherwise shown on the Drawings.
- D. No valve and no piece of equipment or trim shall support the weight of any pipe.
- E. Support all pipe from the building structure so that there is no apparent deflection in pipe runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Do not support pipe from or brace to ducts, other pipes, conduit, or any materials shown on the Drawings. Piping or equipment be immobile and shall not be supported or hung by wire, rope, plumber's tape or blocking of any kind.
- F. Install all piping free from traps and air pockets and true to line and grade.
- G. Wherever changes in sizes of piping occur, make such changes with reducing fittings, as the use of face bushings will not, in general, be permitted. Install eccentric reducing fittings where necessary to provide free drainage of lines.
- H. Furnish and install insulating unions or insulating flanges as hereinbefore specified at all connections of ferrous and non-ferrous piping.
- I. Fire stop all pipes penetrating fire rated construction in accordance with specification Section 07 84 13, Penetration Firestopping.
- J. No cutting or drilling of structural members shall be done without prior written approval of structural engineer.
- K. Rough-In Work: Proceed as rapidly as the building construction will permit. All piping shall be completed, tested and approved before being enclosed.
- L. Thoroughly clean piping before installation. Cap all pipe openings to exclude dirt until fixtures are installed and final connections are made.
- M. Provide a drip at any point in the gas lines where condensate may collect. All drips shall be readily accessible to permit cleaning or emptying.
- N. Show no tool marks or threads on exposed plated, polished or enameled connections to fixtures.
- O. Provide each connection to faucet or fixture with an air chamber, eighteen inches (18") long, placed in a vertical position and one (1) pipe size larger than the pipe served.
- P. Pitch: Horizontal sanitary and storm drain piping shall be installed at a uniform grade of not less than one-fourth inch (1/4") per foot, unless otherwise indicated or directed.
- Q. Contraction and Expansion: Install all work in such a manner that its contraction and expansion will not do any damage to the pipes, the connected equipment, or the building. Install offsets, swing joints, expansion joints, seismic joints, anchors, etc., as required to prevent excessive strains in the pipe work. All supports shall be installed to permit the materials to contract and expand freely without putting any strain or stress on any part of the system. Provide anchors as necessary.

- R. Equipment and Fixtures Furnished under other Sections: For rough-ins and connections to fixtures and equipment furnished under other sections, ascertain exact sizes, services and locations before starting work. Verify accuracy of work shown on drawings before starting work. Contractor is responsible for providing proper installation. Provide proper prevention on all hot and cold water service.
- S. All piping shall be installed within designated finished and open ceiling heights as noted on the architectural drawings.
- T. Coordinate the installation of access panels with the equipment or valve being served. Valves and equipment located in ceiling spaces shall be accessible and located no more than 2'-0" above the access panel and within arm reach. Distances greater than 2'-0" only allowed when it is not possible to meet the 2'-0" requirement. Approval from the Owner's representative shall be obtained for such installations.
- U. Provide membrane clamping device for all piping drains and hose bibbs passing through any waterproof membrane.
- V. Powder actuated fastening systems will not be allowed. Embeds, beam clamps, or drilled fasteners will be required, unless otherwise noted. Earthquake bracing shall be required for all piping.
- W. All piping into stem walls and footings shall be double half lap wrapped with one-eighth inch (1/8") thick "Armaflex" insulation. The Contractor shall also provide blocked out areas in stem wall and footing as required for the installation of the piping. All piping shall avoid the lower eight inches (8") of the footing and the Contractor shall coordinate and provide dropped footings as required for the installation of the underground piping.
- X. All piping on roof shall be anchored to neoprene or close-cell polyethylene blocking with pipe straps. Blocking shall be set in mastic at 6'-0" on center.
- Y. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.
- Z. Provide pipe isolation for all piping through walls and floors. No piping shall have direct contact with walls, ceilings, floors, pipe supports, or hangers.

3.3 INSTALLATION OF UNDERGROUND GAS PIPING

- A. Underground polyethylene pipe and fittings shall be installed by personnel certified by the pipe manufacturer as having received instructions directly from the pipe manufacturer's field representative. Contractors not having certified personnel will be required to have a factory representative of the pipe manufacturer visit the site at the time of underground pipe installation and provide the required instructions. All required cost for training and certification shall be paid for by Contractor.
- B. Plastic pipe joints shall be made by the socket or butt heat fusion methods only, and shall not be disturbed until they have properly set. Plastic pipe may not be joined by threaded joints, miter joints, or other mechanical joints.
- C. Plastic piping components are susceptible to damage by mishandling. Gouges, cuts, kinks or other forms of damage may cause -failure. Care shall be exercised during handling and installation to prevent any such damage. The Contractor shall inspect carefully all plastic pipe after each handling operation for cuts, gouges, deep scratches, or other imperfections that could adversely affect serviceability.

- D. Plastic pipe that has been damaged during the course of handling or installation shall be removed and replaced. The use of patching saddles, branch saddles, or band-type clamps for the repair of leaks in plastic pipe shall not be permitted. Sections of plastic pipe containing unacceptable defects shall be cut out and replaced with serviceable plastic pipe, using heat fusion fittings. All joints shall be made only by personnel who are qualified to make such connections, using heating and fusion joining tools that have been specifically approved.
- E. Plastic pipe shall be installed in such a way that shear or tensile stresses resulting construction, or other external loadings are eliminated.
- F. Care shall be exercised at all times to protect the plastic materials from fire, excessive heat, or harmful chemicals. Thermoplastic pipe and fittings shall be protected from long-term exposure to direct sunlight.
- G. The piping shall be installed with sufficient slack to provide for possible contraction.
- H. Plastic pipe may be deflected per manufacturer's recommendations. Bends shall be free of buckles, cracks or other evidence of damage. Miter bends are not permitted.
- I. Where substructures cannot be avoided by the use of smooth bends, the contractor shall make the necessary elevation changes or offsets using 45-degree socket fusion elbows. A minimum separation of twelve inches (12") shall be maintained between the pipe and any other substructure unless the Inspector waives this requirement due to unusual circumstances which render it impractical.
- J. The Contractor shall take all reasonable steps during handling and installation in order to minimize the possibility of dirt or other foreign materials getting inside the pipe. Plastic pipe ends shall be kept closed when left in trench excavations or in work areas for overnight periods. Factory installed caps shall be left on plastic pipe until ready for immediate use.
- K. Pipe shall be installed with an electrically twelve (12) gauge solid copper tracer wire with black THNN insulation to provide a means of locating the pipe. The tracer wire shall be taped to pipe at intervals of not more than six feet (6'). Where the transition from steel to plastic occurs the tracer wire shall be securely brazed to the steel portion of the transition fitting. The tracer wire shall terminate above grade at each end. A tracer wire continuity check shall be completed by the contractor and approved by the inspector prior to the excavations.
- L. Control of static electricity during squeeze-off and purging operations: Friction induced static electricity can build up on any non-conductive surface, such as plastic pipe, creating the possibility of a spark discharge of sufficient energy to cause ignition of blowing natural gas if the proper air/gas mixture is present. A film of water on the surface of the pipe provides a conductive path to rapidly diffuse static electricity. All pipe in the work area which may be touched during purge or squeeze operations must be sprayed, doused with water, or kept wet by wiping it with a water saturated absorbent cloth. Leave the wet cloth wrapped around the pipe near the end of the opening. Where metallic pipe is involved, construction personnel shall wear dry gloves and take precautions to prevent any other part of the body from coming into contact with pipe, fittings, etc. to help ensure the prevention of accidental ignition of blowing gas.
- M. Upon completion of the gas piping underground installation, Contractor shall submit a written report directly to the Owner's Representative stating that all materials installed are as specified and approved, and that installation was done by factory certified tested to 60 psi.

3.4 PIPE JOINTS

- A. Ream pipe ends to remove burrs, inspect each length of pipe carefully and remove all obstructions prior to fabrication.
- B. Screwed Piping: Cut with machine cutter, hand pipe cutter or carborundum pipe wheel with file or scrapper or pipe reamer. Do not ream to exceed I.D. of pipe and thread to ANSI B2.1 requirements. Use Teflon tape on male thread prior to joining other services. No more than two full threads shall remain exposed after joining. Teflon tape shall not be used on steam trap piping.
- C. Copper Tubing: Cut square; remove burrs and clean pipe and inside of fitting to a bright finish with steel wool, wire brush, sandpaper or emery cloth. Apply solder flux with brush to tubing. Remove internal parts of solder-end valves prior to soldering. Provide dielectric unions at points of connection of all copper tubing and any ferrous piping and equipment.
- D. Threaded Joints: Use threaded joints for natural gas pipes of size 2 inches and smaller. Where possible use pipe with factory-cut threads, otherwise cut pipe ends square, remove all fins and burrs, and cut taper pipe threads per ANSI B2.1. Threads shall be smooth, clean, and full-cut. Apply thread tape to male threads only. Work piping into place without springing or forcing. Backing off to permit alignment of threaded joints will not be permitted. Engage threads so that not more than two threads remain exposed. Use unions for connections to valves for which a means of disconnection is not otherwise provided.
- E. Welded Joints: Use welded joints for natural gas piping of sizes larger than two inches and all fuel oil piping. Weld by the shielded metal-arc process using covered electrodes and in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified for the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test report. Contractor shall conduct the ANSI qualification test.

3.5 PIPE SUPPORTS

- A. Maximum hanger spacing and rod sizes for horizontal runs of piping shall be as noted in Table 3-1 & Table 3-2 of the California Plumbing Code.
- B. Every branch of piping over three feet (3') long shall have a separate hanger. Support at each horizontal branch connection. Provide at least one (1) hanger per branch.
- C. Support all suspended piping with clevis or trapeze hangers and rods.
- D. Hangers and supports shall be adequate to maintain alignment and prevent sagging and shall be placed within eighteen-inches (18") of a joint. Support shall be provided at each horizontal branch connection. Hangers shall not be placed on joints. Make adequate provision to prevent shear or twisting of the pipe or joint.
- E. Support for cast iron no-hub pipes shall be adjacent to joint, not to exceed eighteen inches. Provide hangers on the piping at each side of and within eighteen inches (18") of a no-hub pipe coupling so that the coupling will not bear any weight. Provide supports at every other joint, unless over four feet (4') then support on each side of the coupling within eighteen inches (18") of the joint. Hangers shall not be placed on the coupling. Provide hangers adequate to maintain alignment and prevent sagging of the pipe. Make adequate provision to prevent shear or twisting of the pipe or joint.

3.6 CLEANOUTS

- A. Size: Cleanouts of same nominal size as pipe they serve, except where they occur in piping four inches (4") and larger, in which case they shall be four inches (4") in size.

- B. Accessibility: Make all cleanouts accessible. Use graphite on all cleanouts with all threads being thoroughly greased after acceptable pressure test.
- C. Cleanouts Locations:
 - 1. Where indicated on drawings and as noted. Exact locations as directed by the Representative.
 - 2. At all horizontal offsets.
 - 3. At ends of or storm drain lines more than five feet (5') in length.
 - 4. At one-hundred feet (100') maximum intervals on all or drain horizontal runs within the building lines.
 - 5. At base of all soil/waste stacks and storm drain lines.
 - 6. For cleanouts in finished portions of building, locations subject to Owner Representative's approval before installation.
 - 7. Do not locate floor and wall in patient rooms, electrical rooms and elevator machine rooms.

3.7 ROOF OPENINGS

- A. Flash each pipe extending through roof with properly sized lead flashing assembly. Make watertight. Install vent caps on all vents through roof.

3.8 PLUMBING FIXTURES INSTALLATION

- A. Installation: Set Fixtures level and in proper alignment with respect to walls and floors, and sets of fixtures equally spaced. Install supplies in proper alignment with fixtures and with each other. Install flush valves in alignment with the fixture without vertical or horizontal offsets.
- B. Seals: Seal all wall and floor mounted fixtures watertight where fixture is in contact with wall or floors. Fill all cracks and open spaces between fixtures and wall or floor with non-elastomeric sealer. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 92 00, color to match fixture.
- C. Caulking: Caulk all deck mounted trim at the time of assembly, including fixture and casework mounted. Caulk all self-rimming sinks installed in casework.
- D. Trim: Make up trim with care and with the proper tools in order that no tool marks show after installation.
- E. Bolt carrier base supports to floor in accordance with manufacturer's installation instruction and recommendations.
- F. Water Closets and Urinals: Test and adjust all flush valves for water closets and urinals for proper flow. Bowls shall completely evacuate with a single flush. Splashing of water out of the bowl is not acceptable.
- G. Metered Faucets: Test and adjust all metered faucets for proper flow, duration of cycle.
- H. Extra Stock: Furnish special and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten (10) units.
- I. Installation of emergency safety equipment (emergency showers and eyewashes): Install emergency safety equipment in conformance with ANSI 2358.1-1998. Locate identification signs in accordance with this standard. Where shut-off valves are installed in the branch line leading to emergency safety equipment, the valves shall be indicating type (OS&Y or ball valve with lever handle), labeled for identification, and locked in the open position.

3.9 TESTING AND ADJUSTING

- A. Provide all equipment required for testing, including fittings for additional operating. Plumbing Inspector shall be present at time of testing.
- B. After the inspection has been approved or portions thereof, certify in writing the time, date, name and title of the person reviewing the test. This shall also include the description of what portion of the system has been approved.
- C. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job site.
- D. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.
- E. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated. Repairs shall be made with new materials. No caulking of screwed joints or holes will be acceptable.
- F. Protection: Isolate all equipment subject to damage from test pressure. Make no test against a service valve or meter.
- G. No part of any work shall be concealed or covered until after it is inspected, tested and approved by the Inspector. All piping for plumbing shall be completely installed and tested as required by the Plumbing Code. The test pressures indicated are a minimum only. All tests shall be as required by the governing authority as well.
- H. Sanitary Waste and Vent; Waste and Vent; and Drain Piping Systems: No-hub joints shall be tightened using a calibrated torque wrench. The water test shall be applied to the system either in its entirety or in sections. The piping shall be tightly plugged and submitted to a ten-foot (10') head (4.3 psi) of water located at the highest point. Provide a separate standpipe above the highest point being tested or extend the system to obtain the required ten-foot (10') head of water. The water shall be kept for at least thirty (30) minutes before the inspection starts. System shall hold water four (4) hours. Coordinate test tees with wall construction. Test tees shall not interfere with construction. Testing with compressed air or gas is not recommended.
- I. Domestic Water: Test the system with water at a hydrostatic pressure of not less than one hundred twenty-five (125) psi. Provide a pressure gauge located at the highest point of the system being tested, with a shutoff valve and bleeder valve so arranged to check gauge operation. When the piping system operates at higher pressure than seventy-five (75) psi, the hydrostatic test pressure shall be fifty (50) psi above the operating pressure. The test shall be applied not less than 1 hour prior to inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately as specified for the entire system. There shall be no drop at the end of four hours.
- J. Natural gas piping: For gas pressures up to 14 inches water column, the piping shall be subjected to an air pressure test of not less than ten (10) psi gauge pressure and shall be held for a length of time satisfactory to the Administrative Authority, but in no case less than four (4) hours. For gas pressures exceeding fourteen (14) inches water column and welded metal pipe, the test pressure shall be not less than sixty (60) psi gauge pressure and shall be continued for a length of time satisfactory to the Administrative Authority, but in no case for less than thirty (30) minutes. For underground gas pipe, the test pressure shall be not less sixty (60) psi gauge pressure and shall be continued for a length of time satisfactory to the Administrative Authority, but in case for less than four hours. Tests shall be made using air, CO₂, or nitrogen pressure only and shall be made in the presence of the Plumbing Inspector. Test gauges used in conducting tests shall comply with the Plumbing Code.

- K. Apply tests for a minimum period of four (4) hours or tests are complete.
- L. Work may be tested in sections, if necessary, for convenience. In this case, test of last section shall include connections between previously tested sections and section under test.
- M. Furnish all labor and all other utilities required to make tests. Make compliance tests in the presence of the Owner's Representative.
- N. Should any piece of equipment, apparatus, materials, or work fail in any of these tests, immediately remove and replace by perfect material, and retest the portion of the work replaced.

3.10 PIPE DISINFECTION AND CLEANING

- A. Supervision and Testing: Supervision and Testing: Perform disinfection under Plumbing Inspector's supervision. Disinfection shall be subject to written approval upon receipt of satisfactory laboratory test results.
- B. Contractor's Responsibility:
 - 1. Furnish labor, equipment, materials and transportation to disinfect domestic hot and cold water systems and fire lines directly connected thereto, in conformity with procedures and standards described herein.
 - 2. Disinfect domestic hot and cold water systems as required by the Public Health Department and all Authorities Having Jurisdiction.
 - 3. If no disinfection requirements are provided by the Authorities listed above, then disinfection shall conform to California Plumbing Code Sections 609.9.1 through 609.9.4.
- C. Preliminary Preparations:
 - 1. Service Cock: Provide within three feet (3') of the entrance of the supply main to the building, a three-fourths inch (3/4") service cock, or valve, for introducing the disinfecting agent into the lines.
 - 2. Flushing: After final pressure tests and before draining for disinfection, open each fixture or outlet until the water flow is clear.
- D. Standards Necessary for Approval:
 - 1. The water system shall have been uniformly chlorinated under the supervision of Plumbing Inspector.
 - 2. The results of water sample analysis shall be negative for the Aerogenes organisms, with a coliform MPN of less than 2.2 and a total plate count of less than 100 bacteria per milliliter.
 - 3. If the test for the bacteriological quality of the water in the system does not meet the standards, repeat the disinfection procedure until the specified standards are met.
- E. Final Approval: Health Department will give written approval for acceptance and use of the water system after the above procedures have been successfully completed and the standards met.
- F. Temporary hook-ups shall be disinfected. All fittings and piping in temporary systems are to be disinfected.
- G. Upon completion of the work, all records and certifications approving pipe disinfections shall be submitted to the Owner's Representative before final payment is made.

3.11 PROTECTION, CARE AND CLEANING

- A. Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this work and until completion.
- B. During construction, properly cap all lines and equipment nozzles so as to prevent of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint or other work of other trades by covering it with polyethylene sheets.
- C. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put into operation. All systems of any nature shall be thoroughly cleaned and flushed of all pipe contaminates such as cuttings, filings, lubricant, rust, scale, grease, solder, flux, welding residue, debris, etc. Any piece of equipment or part of any system which malfunctions or is damaged due to failure or neglect on the of this Division to observe this paragraph shall be repaired or replaced to the satisfaction of the Owner's by and at the total expense of this Contract.
- D. After completed installation, clean all systems.
 - 1. Piping, and Equipment, Non-insulated or to be insulated: Clean exterior thoroughly to remove most, plaster, cement, and dirt before insulation is applied.
 - 2. Piping and Equipment to Be Painted: Clean exterior of piping, and equipment, exposed in completed structure, removing rust, plaster, cement and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable non-toxic solvents. Touch up primer coat as required.
 - 3. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil, and leave surfaces clean and polished.
 - 4. Plumbing Fixtures: Clean and polish fixtures immediately prior to final inspection of Owner Representative's occupancy. Clean floor drain grates, faucet aerators and outlets, check each fixture to insure against trap stoppage.
 - 5. Chrome or Nickel Plated Work: Thoroughly polish.
 - 6. Factory Finished Items: Remove grease and oil and leave surfaces clean and polished.
- E. All code stamps and nameplates shall be protected from damage and must be clean and legible before final inspection.
- F. All piping shall be flushed out or blown out after pressure testing is complete and before being put into use. All strainer screens shall be removed and cleaned.
- G. After start-up and testing, strainer screens shall again be removed and cleaned.

3.12 PAINTING AND IDENTIFICATION

- A. After completion of hydrostatic tests, all system piping exposed to view in or on the building shall be painted in accordance with Section 09 91 00 - Painting.
- B. Provide pipe, valve, and equipment identification, and signage in accordance with referenced standards, codes and specifications.

3.13 ACCESSIBILITY OF EQUIPMENT

- A. The installation of valves, thermometers, gages, traps, cleanouts, control devices or other specialties requiring reading, adjustment, inspection, repairs, removal or replacement shall be conveniently and accessibly located with reference to the finished building.

3.14 CLOSING IN OF UNINSPECTED WORK

- A. Do not allow or cause any to be covered up or enclosed until inspected, tested and approved.

3.15 EMERGENCY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding the guarantee bond or relieving the Contractor of their responsibility during the bonding period.

3.16 CLEAN UP AND REMOVAL OF SCRAP

- A. For work under all Mechanical Sections, trash and scrap shall be cleaned up and removed from the site as the work progresses.

3.17 PRELIMINARY OPERATIONS

- A. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

3.18 EXCAVATION AND TRENCHING: (As required for this section)

- A. Trenches for underground piping shall have uniform grades same as for pipe. Pipe shall be embedded in six inches (6") minimum layer of clean sand all around.
- B. Loose earth shall be tamped solid around sides and on top of sand-covered pipe and remainder thoroughly compacted to prevent settlement of the surface. After completion of backfill, the grade shall be finished to match the existing, or as directed. All paving and walkways shall be finished to match the existing.
- C. Provide and maintain dewatering pumps as required. After piping installation, it shall be inspected and approved by the Owner's Representative before Backfill shall not be placed on or around piping for twenty-four (24) hours after pipe joints have been made and before lines are properly tested and approved.
- D. Provide barricades, signs, lanterns, shoring, sheeting and pumping as part of Work in this Division as required to insure safe conditions. Provide shoring and cross bracing of sufficient strength to properly support the walls of all excavations at depth of four feet (4') or more as required to protect personnel, and as required by OSHA.
- E. Minimum bury for piping exterior to the building shall be thirty-six inches (36") minimum cover from top of pipe to finished grade except as otherwise shown, or as determined by invert elevations. Contractor shall verify all piping elevations, and invert elevations before starting work.
- F. Excavation and pipe installation on public property shall be fully coordinated for timing and procedures with the authorities having jurisdiction. Work shall to all local Public Work rules and regulations. All paved areas and concrete sidewalks damaged during this work shall be repaired to match existing when new to the satisfaction of the governing authorities.
- G. Dispose of all surplus excavation material and seepage water as directed by general contractor and in accordance with local codes and applicable laws.

- H. Trees: When it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and roots. Where a ditching machine is run close to trees having roots smaller than two inches (2") in diameter, the wall of the trench adjacent to the trees shall be hand trimmed making clean cuts through the roots. All cuts through roots one-half inch and larger in diameter shall be painted with "Tree-Seal", or equal. Trenches adjacent to trees should be filled within twenty-four (24) hours after excavation, but where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas. Stockpiling of earth or building materials within the drip line of trees is prohibited. Where any roots two inches (2") and larger are encountered, the Contractor shall hand tunnel under root and protect it by burlap wrapping.
- I. Water piping shall not be run in the same trench with sewer or drainage piping unless separated as required by the plumbing code.
- J. Pitch: Horizontal sanitary and storm drain piping shall be installed at a uniform grade of not less than one-fourth inch per foot, unless otherwise indicated or directed.

3.19 BACKFILL

- A. Trenches: Do not place backfill in trenches until pipe installation has been reviewed and accepted by the Owner's Representative.
- B. Within twenty-four (24) hours or as soon as pipe has been laid and inspected, place in layers to the elevation at which excavation was begun, or to a height of six inches (6") from rocks or lumps greater than four inches (4") in any dimensions. Place in six-inch (6") layers and bring up evenly and tamp continually on both sides of pipe. Use excavated materials or other approved materials as directed. Tamp by hand or with pneumatic tampers. Machine tamping and compaction by flooding or puddling will not be accepted.
- C. Compaction: Relative compaction of backfilling for pipe trenches and concrete structures shall be not less than 90 percent in accordance with Test Method No. Calif. 216 and ASTM D1557-58T. Fills below structures and the upper eighteen inches (18") of sub-grade beneath areas to be paved shall be compacted to 95%.
- D. Settling: which subsides or settles below finish grades or adjacent ground during warranty period shall be removed to top pipe and replaced with compacted fill as specified.

3.20 TRAINING

- A. Submit a written test schedule to the Owner's Representative for approval a minimum of three (3) weeks prior to proposed training dates.
- B. Provide three (3) sessions of two (2) hours each of instruction to the Owner regarding proper use and operation of the system. Submit a written course outline and a sample of all manuals to be used two (2) weeks prior to the scheduling of the training. Training shall include both classroom and "hands-on" sessions and shall occur after final inspection and testing. Location and timing of the training session is to be arranged with the Owner's Representative.
- C. Two weeks prior to scheduled training dates, furnish the Owner's Representative with six (6) bound copies of complete instructions, including catalog cuts, diagrams, drawings, and other descriptive data covering the proper testing, and maintenance of each type of system installed, and the necessary information for ordering replacement parts. In addition, post one (1) copy of complete instructions at the control panel location.
- D. Session shall include detailed training and instructions covering the necessary and recommended testing, operating, and maintenance procedures for each type of system.

Session shall include training and instructions covering the emergency operation procedures for type of system.

- E. Session shall include training and instructions covering the emergency operation procedures for each type of system.

END OF SECTION

08/27/18

SECTION 23 05 00

GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.4 RELATED DOCUMENTS

- A. The General Conditions, Special Conditions, and Division 1 - General Requirements, are hereby made a part of this Section as if repeated herein.
- B. These General Mechanical Provisions apply to the entire Division 23 00 00.

1.5 DESCRIPTION

- A. Work Included: Furnish all labor, materials, equipment and pay all fees required to complete all plumbing work shown on the drawings and specified herein.
- B. Related work included in other sections:
 - 1. Electrical.
 - 2. Painting.
 - 3. Access Panels.
 - 4. Concrete Work.
 - 5. Landscape Irrigation.
 - 6. Site Work.

1.6 INCORPORATED DOCUMENTS

- A. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work of this Section, including those noted below:
 - 1. Associated Air Balance Council (AABC).
 - 2. Air Diffusion Council (ADC).
 - 3. American Gas Standard (AGA).
 - 4. Air Moving and Conditioning Association (AMCA).
 - 5. American National Standards Institute (ANSI).
 - 6. Adhesive and Sealant Council (ASC).
 - 7. American Society of Mechanical Engineers (ASME).
 - 8. American Society for Testing and Materials (ASTM).
 - 9. Air Conditioning and Refrigeration Institution (ARI).
 - 10. American Society of Civil Engineers (ASCE).
 - 11. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
 - 12. National Environmental Balancing Standards (NEBB).
 - 13. National Electrical Manufacturers Association (NEMA).
 - 14. National Fire Protection Association (NFPA).
 - 15. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - 16. Underwriters' Laboratories, Inc. (UL).

1.7 LEGAL REQUIREMENTS AND STANDARDS

- A. General: Comply with applicable sections of state and local codes, laws ordinances, rules and regulations of authorities having jurisdiction.
- B. Codes and Standards: Conform to applicable sections of codes and standards, including:
 - 1. California Energy Conservation Code, Title 24.

2. Occupational Safety and Health Administration (OSHA).
3. State Fire Marshal requirements.
4. California Electric Code (CEC).
5. California Building Code (CBC).
6. California Mechanical Code (CMC).
7. California Plumbing Code (CPC).
8. Division of the State Architect Offices of Regulation (DSA).

C. Minimum Requirements:

1. Comply with requirements of authorities as minimum acceptable work.
2. The drawings and specifications take precedence when they call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations.

1.8 QUALITY ASSURANCE

A. Products Criteria:

1. Supply all equipment and accessories new, free from defects.
2. Supply all equipment and accessories in compliance with the applicable standards listed in Article 1.4 of this sections and with all applicable national, state, and local codes.
3. Electrical Equipment: Listed by UL and shall bear their label.
4. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
5. Products shall be supported by a service organization that maintains a complete inventory of repair parts and is located reasonably close to the site.
6. When two or more units of materials or equipment of the same type or class are required. These units shall be products of one manufacturer.
7. Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
8. Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
9. Asbestos products or equipment or materials containing asbestos shall not be used.
10. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Owner prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

B. Qualifications of Installers: For the actual fabrication, installation and testing of work under this Section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer' current recommended methods of installation.

C. Before any welding is performed, submit a copy of the Welding Procedure Specification (WPS) together with the Procedure Qualification Record as required by Section 9 of the ASME Boiler and Pressure Vessel Code.

1. Before any welder performs any welding, submit a copy of the Manufacturer's Record of Welder or Welding Operator Qualification Tests as required by Section 9 of The ASME Boiler and Pressure Vessel Code. The letter or symbol (as shown on the qualification test form) shall be used to identify the work of that welder and shall be affixed in accordance with appropriate construction code, to each completed weld.
2. The types and extent of non-destructive examinations required for pipe welds are shown in Table 136.4 if the Code for Pressure Piping, ANSI/ASME.

D. Requirements of Regulatory Agencies and Standards:

1. Permits: Obtain and pay for all fees, permits and inspections. Deliver all certificates of inspection to Architect [IOR].
 2. Arrange and pay all costs for utilities required to complete all work of this Division. Connection to all utility company or on-site services, payment of service charges and provision for and installation of temporary utilities is included.
 3. The requirements of authorities shall be minimum acceptable requirements for the work. When contract drawings or specifications call for materials or construction of better quality for larger size than required by codes, laws, rules and regulations, the drawings and specifications take precedence.
- E. Drawings:
1. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. All scaled and figured dimensions are approximate and are given for estimating purposes only. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices that may be required to complete the installation. Before proceeding with any work, carefully check and verify all dimensions and sizes.
 2. As far as possible the work has been indicated on the drawings in such position as to suit and adapt to the work of other trades, but the work as indicated is largely diagrammatic and shown primarily for clarity. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the work of all other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown.
 3. When apparatus and equipment have been indicated on the drawings, dimensions have been taken from typical equipment of the class indicated. The locations of apparatus, piping, and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
 4. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the rough-in of connections.
 5. Be responsible for any cooperative work which must be altered due to lack of proper supervision or failure to make proper provision in time. Such changes shall be directly supervised by the Architect and made to his satisfaction.
 6. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for submittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

1.9 DEFINITIONS

- A. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms, or completed work.
- B. Option or Optional: Contractor's choice of an alternate material or method.
- C. Install: To physically erect, mount and connect complete with related accessories.
- D. Supply: To purchase, procure, acquire and deliver complete with related accessories.
- E. Furnish or Provide: To supply, install, and connect up complete and ready for safe and regular operation of particular work referred to, unless specifically noted otherwise.

- F. Work: Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.
- G. Wiring: Raceway, conduit, fittings, wire, boxes, and related items.
- H. Concealed: Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures, and not exposed to view in the completed work.
- I. Reviewed, Satisfactory, Accepted, or Directed: As reviewed, satisfactory, accepted or directed, by or to Engineer.
- J. Motor Controllers: Manual or magnetic starters (with or without switches), individual pushbuttons or hand (HOA) switches controlling the operation of motors.
- K. Control or Actuating Devices: Automatic sensing and switching devices such as thermostats, pressure, switches and relays, etc., controlling operation of equipment.
- L. Indicated, as Shown, or Noted: As indicated, shown or noted on Drawings or Specifications.
- M. Similar or Equal: Of base bid manufacturer, equal in materials, weight, size, design and efficiency of specified product.
- N. Engineer: Mechanical Engineer of Record.
- O. Accessible: Capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

1.10 SITE EXAMINATION

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirement of the contract. Compare site and existing conditions to the mechanical, electrical, architectural, structural, civil, and other drawings and specifications. Call any discrepancies to the attention of the Architect during bidding period. Make allowances for them in preparing the bid.

1.11 ELECTRICAL WORK

- A. Quality: Work shall comply with requirements of Division 26 and applicable codes.
- B. Wiring: all wiring shall be in electrical conduit or as indicated on drawings.
- C. HVAC Control Wiring: Provide control wiring for starter holding coils, relays, interlock and temperature controls.
- D. Provide controls, controllers, relays, transformers, switches, duct mounted products of combustion detectors, time clocks, etc., required by work of this Division.

1.12 SUBSTITUTION OF MATERIALS:

- A. The design has been based on the manufacturer's name and product listed on the drawings or named first in these specifications. Other manufacturers' names listed in these specifications may be selected and considered "as equal" for quality only; however, they must match the performance, construction, fit and features of those selected for design. The

acceptance of these does not relieve the Contractor for responsibility of providing the required materials and providing a workable system.

1. In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
 2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and the submittal will not be allowed.
- B. Should the contractor wish to substitute equipment or material other than those considered for the basis of design, the contractor shall submit information as called for in "Submittal of Materials and Equipment" for both the specified or scheduled item and the substitute item. These submittals will show that both the specified and the substitute material match in quality, performance, construction, fit and features of those selected for design. Any equipment or material submitted for substitution without the comparison information will not be reviewed or acceptable.
- C. Liability of Substitutions:
1. Performance of substitutions must be equal to the item specified. If the substituted item fails to perform according to the specifications, replace with the originally specified item without extra compensation on request of the Architect any time within the guarantee period.
 2. The contractor is responsible for the cost of any changes to other trades and additional Architectural and Consulting fees resulting from approved substitutions in mechanical equipment.
 3. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
 4. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

1.13 SUBMITTAL OF MATERIALS AND EQUIPMENT

- A. Submittal:
1. Submittals for a product or material or area of work must be complete. **PIECEMEAL SUBMITTAL WILL NOT BE ACCEPTABLE.** All submittals shall be factory or manufacturer certified. Vendor's submittal data not acceptable.
 2. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
 - a. Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
 - b. Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
 3. Identify submittal with Architect's project name, number and with item designation as indicated on drawings, and referenced to applicable paragraphs of the specification. Submit in brochure form.
- B. Review of Submittal: These will be reviewed for general design only, and not for method of assembly, erection, construction, or detailed compliance with contract documents. All

submittals shall be factory or manufacturer certified. Submittal technical data and dimensions by Vendor are not acceptable.

C. Manufacturer's Data:

1. Include data for all material and equipment that will be installed.
2. Include complete catalog information such as construction, capacities, types, fan curves, pump curves, sizes, etc. Also include dimensional data, and sufficient information to illustrate compliance with the specifications and list labeling and/or approving agencies and standards of design employed in manufacturer data.

D. Shop Drawings:

1. Prepare dimensionally accurate floor plans and Sections in tight conditions as required of all equipment rooms and all floor plans. Show all equipment, complete ductwork, piping (including plumbing and sprinkler pipes), accessories, and also clearances for operating servicing and coordination with other systems. Indicate bottom elevation for both pipes and ductwork.
2. Automatic temperature control systems, wiring diagrams, control panel boards. Include in wiring diagrams all low and line voltage wiring and equipment.
3. Drawings clearly identified with the Architect's project name and number, and a sheet title identifying its contents.
4. Show location of thermostat(s) and sensors.

1.14 SHOP, OFFICE AND STORAGE

- A. Provide temporary shop, office and storage space on site only at locations approved by Architect, as required for execution of work. Remove these facilities upon completion of work.

1.15 JOB CONDITIONS

- A. Where new pipes are to be connected to an existing pipe, verify location, size, elevation and all other information necessary for connection. This verification shall be done prior to installation of the new pipe. Should there be a problem, contact the Architect **[IOR]** immediately to resolve the problem.
- B. Interruption of Services:
1. Before making any connections or doing any work which interrupts services to existing buildings, notify Owner in writing at least 72 hours in advance; and such work performed as quickly as possible and only at such times as designated by Owner.
 2. Length of time existing services is shutdown to be approved by Owner.
- C. Restoration of Damage: Repair or replace, as directed by Architect, materials and parts of premises which become damaged because of installation of work of this Division. Remove replaced parts from premises. Keep accumulation of dust and debris to a minimum. Remove and dispose of debris in a legal manner. Burning and/or selling material at the site is prohibited.
- D. Cleaning Equipment and Premises:
1. Clean equipment and materials: Remove all dirt, grease, splashed paint, plaster and similar foreign materials. Restore damaged finishes to original condition.
 2. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish resulting from operations.

1.16 REVIEW OF CONSTRUCTION

- A. Work may be reviewed at any time by representatives of Owner or representatives of Architect.

- B. Advise Architect that work is ready for review at following times:
 - 1. Prior to backfilling buried work.
 - 2. Prior to concealment of contract have been completed.
 - 3. When requirements of contract have been completed.
 - 4. Do not backfill or conceal work without Architect's consent.
- C. Maintain on job a set of specifications and drawings for use by Architect's representative.
- D. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect and at no additional cost to the Owner.

1.17 MATERIALS

- A. In addition to material and equipment specified, also provide incidental materials required to effect complete installation. Such incidental materials and equipment shall be uniform throughout the installation. Equipment or fixtures of the same type shall be of same manufacturer.
- B. Protection of Materials:
 - 1. Protect materials, equipment and apparatus provided under this Division from damage, water, dust, or similar impairment, both in storage and installation until Notice of Completion has been filed. Materials, equipment or apparatus damaged because of improper storage or protection will be rejected and must be removed from the site.
 - 2. Cap openings in pipes and ends of valves with manufactured caps and fittings. Do not use taped caps.
 - 3. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

1.18 TESTING

- A. Provide tests specified hereinafter, where applicable. Provide written verification that the tests have been successfully completed.

1.19 RECORD DRAWINGS (AS-BUILT DRAWINGS)

- A. Contractor shall provide and keep up-to-date a complete and accurate "as-built" record set of blue line prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. This record shall be kept up-to-date on blue line prints as the job progresses and shall be available for inspection at all times. Submit completed drawings to Architect in compliance with Division 1.
- B. Include on as-built drawings:
 - 1. Main shut-off valves, plainly marked and identified.
 - 2. Position of all buried or concealed mains accurately dimensioned, both horizontally and vertically.
 - 3. Changes in location of piping, duct or equipment from construction documents. Bottom elevations of each duct and pipe.
 - 4. Ceiling and duct access panel locations.
 - 5. Location of temperature control devices including static pressure control probe, stats, selected zones, etc.
 - 6. Location of all equipment.
 - 7. Invert elevation of sewer and storm drain pipe below grade.

1.20 OPERATING AND MAINTENANCE DATA

- A. General: Submit to the Architect before acceptance of the installation, complete and at one time. Partial or separate data will not be accepted. Data shall consist of the following minimum submissions:
1. Piping Identification Schedule: Copy of charts as specified under valve tags and charts.
 2. Simplified and consolidated control drawings.
 3. Equipment: List of nameplates, including nameplate data and system served.
 4. Manufacturer's Literature: 3 copies of manufacturer's instructions for operation and maintenance of all mechanical equipment, including replacement parts list.
 5. Written Instructions: Typewritten instructions for operation and maintenance of these systems composed of Operating Instructions and Maintenance Schedule. 4 copies submitted to the Engineer for approval.
 6. Operating Instructions: A brief description of the system indicating proper setting of switches and other equipment furnished for providing control of the system and its components by the operator. Do not include adjustments requiring the technical knowledge of the service agency personnel.
 7. Maintenance Instructions: A list of each item of equipment requiring inspection or lubrication, describing the performance of such maintenance, and the month of the year when each item of equipment should be inspected, serviced, or lubricated.
 8. Maintenance Schedule: A list of each item of equipment requiring maintenance, showing the exact type of bearing on every component of each item of equipment, and the frequency when each item of equipment should be inspected or serviced.
 9. Verbal Instructions: Upon completion of the work, and at a time designated by the Architect, instruct the Owner's representative in the operation and maintenance of the equipment supplied by his company.
 10. Binders: Four complete sets of the above data in loose ring binders with permanent covers, with permanent identification on back and index.

1.21 COMPLETION

- A. Before Final Review: The work hereunder will not be reviewed for final acceptance until Operating and Maintenance Data, Manufacturer's Literature, Valve Directories, Piping Identification Code Directory and nameplates specified herein have been approved and properly posted in the building and final cleaning has been completed.
- B. Demonstration of Operations: When the installation is complete and adjustments specified herein have been made, operate the systems for one week, during which time demonstrate to the Architect that systems are completed and operating in conformance with these specifications.

1.22 GUARANTEE

- A. General: Conform to the GENERAL CONDITIONS of the specifications.
- B. Contractor shall guarantee the entire mechanical, plumbing and piping systems unconditionally for a period of two (2) years after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- C. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of two (2) years after date of acceptance of his work.
- D. Parts Warranty: Provide standard warranty of manufacturer for replacement of parts to apply after expiration of above period. Furnish replacement parts to Owner or to his service agency

as directed. Furnish Owner printed manufacturer's warranties' complete with material included and expiration dates upon completion of project.

- E. Warranty also applies to services including instructions, adjusting, testing, noise, balancing, etc.

PART 2 - PRODUCTS

2.4 GENERAL

- A. Beyond material and equipment specified, also provide incidental materials required to effect complete installation. Such incidental materials include solders, tapes, caulking, mastic, gaskets, and similar items.
- B. Materials and equipment shall be uniform throughout the installation. Equipment of the same type shall be of same manufacturer.
- C. Products from other manufacturers not listed shall submit specifically in accordance with Specification Section 01 25 13 – Product Options and Substitutions.

2.5 VALVES

- A. For Domestic Water Service refer to specification Section 22 00 00 Plumbing.

2.6 HANGERS AND SUPPORTS

- A. All required seismic bracing shall be installed as per Title 24, Part 2, 2016 CBC for total lateral forces prescribed in ASCE 7-10.
- B. Installation shall be as published by SMACNA or OSHPD anchorage pre-approved restraint system. All hanger material to be electroplated zinc or hot-dipped galvanized. No plain (black) finish allowed.
- C. Trapeze suspension (trapeze hangers may be used for parallel lines if pipes pitch same direction): Size channel assembly in accordance with manufacturer's published load ratings. No deflections shall exceed 1/360 of span (refer to Superstrut load tables).
- D. Support and laterally brace all ducts, pipes, and equipment per latest SMACNA Manual Standards.
- E. Do not support weight of piping from mechanical equipment, i.e., coil connections.
- F. Do not cut or weld to any structural steel without permission of Architect.
- G. Provide Semco, Trisolator, or equal pipe isolator at all hangers for non-insulated pipes.
- H. Schedule of hangers and supports:

INDIVIDUAL PIPE HANGERS		
Pipe Size - inches	Hanger	Minimum Rod Size - inches
1/2" thru 2"	Superstrut C711	3/8"
2-1/2" thru 3"	Superstrut C711	1/2"
4" and 5"	Superstrut C711	5/8"

INDIVIDUAL PIPE HANGERS		
Pipe Size - inches	Hanger	Minimum Rod Size - inches
6"	Superstrut C711	3/4"
8"	Superstrut C711	7/8"

TRAPEZE HANGERS	
Single or Double 12 Gauge Channel	Superstrut A1200 or A1202
Straps	Superstrut 70 or 702 series
Pipe Isolators	Superstrut 1-716 Cush-A-Clamp

WALL SUPPORT	
Individual pipe sizes up to 3"	Superstrut S250
Individual pipe sizes 4" thru 8"	Superstrut S251

- a. For plumbing hot and cold water 1" and smaller, see Section 22 00 00.

2.7 ROOF, WALL AND FLOOR PENETRATIONS

- A. All pipe penetration through poured concrete wall or floor shall be sealed with Metra-seal as shown on drawings. All other pipe penetration holes shall be sealed with a product that will seal against the spread of flame, smoke, gases and water, for up to a 3 hour rating. Product shall be as manufactured by 3M Brand (Fire Barrier Penetration Sealing Systems) or equal. Product must have been tested and classified by Underwriters' Laboratories and listed in the UL Building Materials Directory; "Through-Penetration Fire stop Systems (XHEZ)," and "Fill, Void or Cavity Materials (XHHW)." Submittal shall reflect product and manufacturers Spec-Data sheet reflecting approvals.

- B. Provide pipe sleeves as follows:

SLEEVE LOCATION	SLEEVE MATERIAL
Floor membrane waterproof	Duco cast iron body with floor and roof construction flashing device, under deck clamp as required, J.R. Smith 1720 or approved equal. Non membrane floor and Standard weight black steel exterior wall pipe with a continuously welded water stop of 1/4" steel plate extending from outside of sleeve a minimum of 2" all around.
Non membrane floor and continuously exterior wall construction.	Standard weight black steel pipe with a welded water stop from outside of a sleeve, a minimum of 2" all around

- C. Length of sleeves as follows:

SLEEVE LOCATION	SLEEVE LENGTH
Floors	Equal to depth of floor construction including finish. Extend minimum 2" above floor level in unfinished area, and in pipe chases.

- D. Escutcheons: Provide 1" wide chrome or nickel plated plates on all pipes exposed to view, passing through floors, walls, partitions, etc. Escutcheons sized to fit pipe and pipe covering and give a finished appearance. Escutcheons held in place by set screws. Provide plates on pipes extending through sleeves.

2.8 ACCESS DOORS

- A. Furnished and installed under this Division.
- B. Install where shown or required by regulatory agencies and for access to all concealed valves, actuators, fire dampers, volume dampers, motors, equipment, etc.
- C. Access doors to be fire rated to match fire rating of wall or ceiling where door is to be installed.
- D. All doors shall have key operated lock.
- E. Door sizes shall be 24" x 24" minimum for ceilings and 12" x 12" minimum for walls.
- F. Non-rated door: 16 gauge frames, 14 gauge steel door, flange of door shall be 3/4" wide, hinge shall be concealed, continuous piano hinge, key operated cylinder lock, and finish shall be prime coat of rust inhibitive grey baked enamel.
- G. Karp Model DSC-214M drywall type with key operated cylinder lock and tile with exact fit. Finish shall be prime coat of rust inhibitive grey baked enamel.
- H. Karp Model KDW for gypsum drywall with key operated cylinder lock and tile with exact fit. Finish shall be prime coat of rust inhibitive grey baked enamel.
- I. Fire rated doors: UL rated for 1½ hour, "B" level in walls and by Warnock Hersey for 3 hours in ceilings. 16 gauge frame, 20 gauge steel, welded pan type door, flange of door shall be 1" wide, 16 gauge steel, hinge shall be continuous, door shall be filled with 2" thick fire rated insulation, bolt type key operated latch, finish shall be prime coat of rust inhibitive grey baked enamel. Karp Model KRP-150FR.
- J. Coordinate all locations with Architect and other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

2.9 SEISMIC RESTRAINTS

- A. General Requirements: Seismic restraints shall be provided for all vibration isolated equipment, both supported and suspended, and all vibration isolated piping.
- B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the mechanical engineer and the field engineer of the Division of the State Architect.
- C. All mechanical equipment shall be braced or anchorage to resist horizontal force acting in any direction per the Seismic note on sheet M0.1:
- D. For Supported Equipment:
 - 1. Pre-approved isolator restraint system by the State of California and bear approval number.
 - 2. Submittal shall include load versus deflection curves up to 1/2" in the x, y, and z planes. Tests shall be conducted in an independent laboratory or under the signed supervision of an independent registered engineer. The snubber assemblies shall be bolted to the test machine as the snubber is normally installed. Test reports shall certify that neither the bridge bearing neoprene elements nor the snubber body has sustained any obvious deformation after release from the load.

3. Submit calculations for each seismic restraint and vibration isolation signed by structural Registered Engineer.

E. Seismic Restraint Systems for Ductwork and Piping:

1. See Seismic notes on Sheet M0.1.
2. The bracing and attachments to the structure shall comply with one of the OSPD Pre-Approvals with OPA #, such as B-Line (OPA 0114), Mason Industries (OPA 349), ISAT (OPA 485) as modified to satisfy anchorage requirements of ACI 318 D.
3. Copies of the bracing system installation guide or manual shall be on the jobsite prior to starting hanging and bracing of the ductwork and pipe distribution systems

2.10 IDENTIFICATIONS

A. Piping:

1. Identify all piping with Brady Perma-Code, Stenton, or approved equal, self-sticking pipe markers consisting of pipe content wording and arrow indicating directions of flow on A.S.A. color background.
2. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other.
3. Markers to be 50 feet apart (maximum) on centers and shall occur where a pipe enters and leaves a concealed space.
4. Use 2" high letter size for pipe or insulation 3" or larger, and 1" size for pipe or insulation 2-1/2" or smaller.
5. Provide at each end of each marker Brady or equal 2 1/4" wide self-sticking clear tape around the periphery of pipe or insulation to further secure the marker.
6. All markers shall be installed after finish painting is complete.

B. Piping Label Colors:

SERVICE	BACKGROUND COLOR	LETTER COLORS
Refrigerant Gas (Inherently Low Hazard)	Blue	White
Refrigerant Liquid (Inherently Low Hazard)	Green	White

- C. Equipment: Each piece of motor-driven equipment shall be identified by engraved plastic-laminate signs. Signs shall be a minimum of 4-1/2" x 1-1/2" with minimum of 1/2" high white letters on a black background, mounted permanently on equipment. The names shall correspond to those given on the control panels be identified as to the area or space served by the equipment. Automatically started motors shall have warning sign: "THIS MOTOR MAY START AT ANY TIME." The equipment shall be further identified with the electrical panel and circuit.
- D. Valves: All valves shall have 1-1/2" diameter brass disc stamped with 3/8" high letters showing type of services and valve number. Tags shall be attached to valves with brass chain.
- E. Refrigerant piping shall be identified in accordance with the UMC Standard 11-2. Identification shall include: type of refrigerant, function and pressure.

2.11 MOTORS AND DRIVES

- A. Type: NEMA Standard open drip-proof, totally enclosed air over (TEAO) or totally enclosed fan cooled (TEFC) type, as specified or indicated on drawings. Class B insulation 1.15 service factor on all motors. All motors shall be of high efficiency.
- B. Manufacturer: General Electric, Gould, Baldor or approved equal.

- C. All motors designed to operate at full load continuously without exceeding NEMA standards. Motors 40 HP and larger shall be part winding type.
- D. V-belt type sized for 150% of the motor horsepower. A minimum of two belts provided for drives where motors are rated one horsepower and larger.
- E. V-belt drive package of adjustable pitch type for motors up to 10 HP, fixed pitch for motors 15 HP and larger.

2.12 DRIVE GUARDS

- A. For machinery and equipment, provide guard as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory fabricated air handling unit casings.
- B. Materials: Sheet steel, cast iron, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, or duct, or electrical connections to equipment.
- C. Access for Speed Measurement: One inch diameter hole at each shaft center.

2.13 TOOLS AND LUBRICANTS

- A. Furnish and turn over to the owner special tools, 2 sets minimum, for each type or size of tool not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease guns with attachments for applicable fittings: one for each type of grease required for each motor or other equipment.
- C. Tool containers: Hardwood or metal, permanently identified for intended service and mounted, or located where directed by the owner.
- D. Lubricants: A minimum of one quart of oil and one pound of grease, of equipment manufacturer's recommended grade and type in unopened containers and properly identified as to use for each different application.

PART 3 - EXECUTION

3.4 REVIEW OF CONSTRUCTION

- A. Work may be reviewed any time by representative of Architect.
- B. Advise Architect that work is ready for review at following times:
 - 1. Before concealment of work in walls and above ceilings.
 - 2. When requirements of Contract have been completed.
- C. Do not conceal work without Architect's consent.
- D. Maintain on project site a set of specifications and drawings for use by Architect's representative.

3.5 NOISE AND VIBRATION

- A. Correct conditions at no cost to the Owner if noise or vibrations because of improper material or installation occurs in the building.

3.6 GENERAL INSTALLATION METHODS

- A. Where pipe passes through seismic joint, install flexible connection as manufactured by Metraflex to allow vertical and horizontal movement during an earthquake.
- B. Carpentry, Cutting, Patching and Core Drilling:
 - 1. Provide carpentry, cutting, patching, and core drilling required for installation of material and equipment specified in this Division.
 - 2. Do not cut, core or drill structural members without consent of Architect.
 - 3. All asphalt and concrete sawing shall not have any outside corners cut.
- C. Waterproof Construction:
 - 1. Maintain waterproof integrity of penetration of materials intended to be waterproof. Caulk penetrations of foundation walls and floors watertight. Provide membrane clamps at penetrations of waterproof membranes.
 - 2. Provide weatherproof NEMA 3R enclosures for all equipment or devices mounted outside or otherwise exposed to the weather.
- D. Sleeves, Chases, and Concrete Inserts:
 - 1. Provide all required sleeves, chases, concrete inserts, anchor bolts, etc., and be responsible for correct location, installation of same.
 - 2. Sleeves and chases are prohibited in structural members, except where approved in writing.
 - 3. Locating and sizing of openings for ductwork through walls, etc., under this Division.
 - 4. Provide sleeves for each pipe passing through walls, partitions, floors and roofs.
 - 5. Set all pipe sleeves and inserts in place before concrete is poured. Coordinate the placing of these items to avoid delaying concrete placing operations.
 - 6. Locate all chases, shafts, and openings required for the installation of the mechanical work during framing of the structure. Do any additional cutting and boring required due to improperly located or omitted openings without cost of the Owner under the supervision of the Architect.
 - 7. Sleeves for un-insulated pipe shall be two pipe sizes larger than pipe passing through or a minimum of 1/2" clearance between inside of sleeve and outside of pipe.
 - 8. Sleeves for insulated piping of adequate size to accommodate the full thickness of pipe covering with clearance for packing and caulking.
 - 9. Caulk space between sleeve and pipe or pipe covering with an incombustible, permanently plastic, water-proof non-staining compound leaving a finished, smooth appearance or pack with incombustible fibrous glass to within 1/2" of both wall faces and provide plastic, water-proof caulking compound.
 - 10. Finish and Plates: Smooth up rough edges around sleeve with plaster.
- E. Mechanical Equipment:
 - 1. Where not otherwise indicated, basis for equipment and material installation is published recommendations of respective manufacturer.
 - 2. Equipment:
 - a. Accurately set and level with supports neatly placed and properly fastened. No allowance of any kind will be made for negligence on part of Contractor to foresee means of bringing in, installing equipment into position inside building.
 - b. All equipment shall be installed accessible on all sides with operable areas having a minimum space clearance as recommended by the manufacturer.
 - c. Where the School District determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.

- F. Piping and/or Ductwork Systems:
1. Work into complete integrated arrangement, with like elements to make work neat appearing finish.
 2. Run concealed, except as shown otherwise.
 3. Exposed pipes and ductwork to run parallel with walls or structural element. Do not install any exposed pipe or ductwork without prior approval of Architect.
 4. Install with adequate passageways free from obstructions, as high as practicable to maintain adequate head room, as shown or as required. Coordinate with work of other Divisions to achieve proper head room as specified in this Division.
 5. Clearance: Do not obstruct spaces required by code in front of electrical equipment, access doors, etc.

3.7 TESTING AND ADJUSTING

- A. General: All defects disclosed as result of the following or other tests or operations shall be promptly repaired by and at expense of Contractor and to Architect's satisfaction. Test shall comply with all necessary codes, rules, and regulations as noted herein before. Contractor shall supply all instruments, labor and tools required by tests. Any defective material and/or equipment shall be repaired, adjusted and replace by new, like materials and equipment, and retested before acceptance.
- B. Clean and purge equipment and piping before each test.
- C. Test various mechanical systems in portions as work progresses. Any system or portion previously tested to become part of any repeated test when it becomes part of distribution or collection system.
- D. Maintain test pressures for periods stated, or as directed, without loss in pressure except that due to change in temperature or authorities having jurisdiction.
- E. Operational Tests: Operational tests shall be made on all machinery and devices to determine proper compliance with specifications. All equipment shall function quietly and efficiently; any undue noise or vibration caused by malfunctioning of piping and equipment shall be promptly repaired and/or corrected before acceptance.
- F. Timing of Tests: Two weeks before expected completion date, the Contractor shall put all systems and equipment into operation and shall continue operation of same during each working day, but not less than five 8-hour periods, until all adjusting, balancing, testing, demonstrations, instructions and cleaning of systems have been completed. Instructions and demonstrations required shall be given simultaneously with this operation.
- G. Duct Leakage Tests: All ductwork with 2" W.C. or higher static pressure shall be tested for leaks, using necessary instruments. Conduct tests as recommended in SMACNA balancing manual. Ductwork handling air pressure less than 2" W.C static pressure shall be sealed wherever visible or tactile observations reveal leakage.
- H. After completion of testing and adjustment, operate the different systems and equipment under normal working conditions for two days and show specified performance. If, in the opinion of the Architect, performance of equipment or systems is not according to specifications or submitted data, alter or replace equipment at no increase in contract sum. Contractor, at his option, may order tests from an independent approved laboratory to prove compliance. All such tests shall be at no increase in contract sum.
- I. At completion of work, perform and submit the Mechanical Acceptance forms (MECH-2 through MECH-5A as applicable) in accordance with Title 24, Part 6.

3.8 INSTALLATION OF PIPING AND EQUIPMENT

- A. Closing-In of un-inspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.
- B. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact locations and depth of existing utility and service lines to which he is going to connect. In event depth of existing sewer main or storm drain is not sufficient to permit installation of piping as detailed on drawings or to make connection in manner indicated; Contractor shall confer with the Architect, Owner's representative and Engineer for Direction.
- C. Conceal all piping within finished rooms, unless otherwise noted on drawings.
- D. Cut pipe accurately to measurements established at the building; work into place without springing or forcing; properly clear all windows, doors and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted.
- E. Make all changes in direction with fittings and changes in main sizes through eccentric reducing fittings. Unless otherwise noted, install water supply and return piping with straight side of eccentric fittings at top of pipe.
- F. Provide sufficient swing joints, ball joints, expansion loops, and devices necessary for a flexible piping system.
- G. Provide union and isolating valves on piping at all equipment or apparatus. Locate valves so that the equipment can be removed without dismantling any branch lines.
- H. Install drain valves at all low points of each system to enable complete drainage, and air vents at all high points in the piping system to enable complete air venting. Install automatic air vent at all high points in the main piping systems.
- I. Support piping independently at pumps, coils, tanks, and the like so that its weight will not be supported by the equipment.
- J. Pipe all drains from pump glands, drip pans, relief valves, air vents, etc., to spill over an open sight drain, floor drain or other acceptable discharge points, and terminate with a plain end unthreaded pipe, 2" above the drain.
- K. Securely bolt in place to building structures, all equipment, isolators, hangers, etc.
- L. Pitch pipe line as required for proper drainage and elimination of air.
- M. Wire for hanging or strapping pipes not permitted.
- N. Support each run of piping independently from all other piping.
- O. Install spring vibration isolation in mechanical rooms and penthouse for all pipes' elbows and also within 40 feet of pipe length.
- P. Equipment Access:
 - 1. Install all piping, equipment and accessories to permit access for maintenance. Relocate piping, equipment and accessories required to provide maintenance access at no additional cost.
 - 2. Furnish access doors where any valves and equipment requiring access for servicing, repairs or maintenance located in walls, chases or above ceilings. Coordinate the

location of access doors of access doors with and install by the applicable Contractor installing walls or ceilings.

- Q. Install gauges, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gauges to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

3.9 PIPE JOINTS

A. Welded Piping:

1. Make welds in a thoroughly first class, workmanlike manner by welders experienced in piping work. Welders used in the work certified as having qualified within the preceding 6 months in accordance with AWS standard qualification procedures.
2. Grind out all welds with cracks, blow holes, porosities or other defects and replace at no additional cost to the Owner. On lightweight piping, extreme care must be taken to prevent burning holes through the piping material. Piping with any such holes must be removed and replaced.

B. Screwed Piping:

1. Cut with machine cutter, hand pipe cutter or Carborundum pipe wheel. Deburr with file or scraper or pipe reamer. Do not ream to exceed I.D. or pipe and thread to ANSI B2.1 requirements.
2. Use Teflon tape on male thread prior to joining other services. No more than 2 full threads shall remain exposed after joining.

C. Copper Tubing:

1. Cut square, remove burrs and clean pipe and inside of female fitting to a bright finish with steel wool, wire brush, sandpaper or emery cloths. Apply solder flux with brush to tubing. Remove internal parts of solder-end valves prior to soldering.
2. Provide dielectric unions at points of connection of all copper tubing and any ferrous piping and equipment.
3. Joining of Copper Pipes:
 - a. Piping 1-1/2" and smaller: 95-5 solder
 - b. Piping larger than 1-1/2": Sil-Fos brazing 1000°F minimum.
 - c. All solder shall be lead free.

3.10 HANGERS AND SUPPORTS:

A. Piping:

1. Space hangers and supports for horizontal copper tubing according to the following schedule:

TUBE SIZE - inches	MAXIMUM SPACING
1" and smaller	6 feet on center
1-1/4" and 1-1/2"	7 feet on center
2" and 2-1/2"	8 feet on center
3" and larger	10 feet on center

2. Space hangers and supports for horizontal iron pipes according to the following schedule:

PIPE SIZE - inches	MAXIMUM SPACING
1-1/4" and smaller	8 feet on center
1-1/2" thru 3"	10 feet on center
4" and larger	14 feet on center

PIPE SIZE - inches	MAXIMUM SPACING
All cast iron	5 feet on center*

- a. * Locate hangers within 18" of each joint per California Building Code.
- 3. Safety Hanger Wires:
 - a. For air diffusers and other mechanical units to be mounted on suspended-grid ceiling systems and weighing less than 20 pounds may be supported directly on the runners of a heavy duty grid system but, in addition, they must have a minimum of two (2) #12 gage slack safety wires attached to the fixture at diagonal corners and anchored to the structure above.
 - b. In advance of ceiling hanger-wire work, provide to job site layouts and/or instruction necessary for proper installation of safety wires.
 - c. Connect safety wires to mechanical diffusers and equipment.
 - d. For diffusers and equipment units weighing 20 pounds or more must be independently supported by not less than four (4) taut #12 gage wires, each attached to the fixture and to the structure above. The four (4) taut #12 gage wires, including their attachment to the structure above, must be capable of supporting four (4) times the weight of the unit.

3.11 IDENTIFICATION OF VALVES

- A. Provide 3 typewritten charts assembled in 3-ring binders showing the valve numbers together with their locations and use. Mount on metal frames and installed as directed the Architect.

3.12 VIBRATION ISOLATION

- A. The entire system, including equipment, air ducts, pipes, motors, and all other parts must be noiseless and free of vibration transmission.
- B. The Contractor shall not install any equipment or pipe which makes rigid contact with the "building" unless it is approved in this specification or by the Architect. "Building" includes slabs, beams, studs, walls, lath, etc.
- C. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.
- D. The Contractor shall correct, at no additional cost, all installations which are deemed defective in workmanship or materials by the Architect.

3.13 PROTECTION, CARE, AND CLEANING

- A. Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this work and until final completion.
- B. During construction, properly cap all lines and equipment nozzles so as to prevent the entrance of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint or other work of other trades by covering it with polyethylene sheets.
- C. After installation has been completed, clean all systems.
- D. Piping, Ductwork and Equipment to be insulated: Clean exterior thoroughly to remove rust, plaster, cement, and dirt before insulation is applied.

- E. Piping, Ductwork and Equipment to be painted: Clean exterior of piping, ductwork and equipment, exposed in completed structure, removing rust, plaster cement, and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable solvents. Touch up primer coat as required.
- F. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil and leave surfaces clean and polished.
- G. Plumbing Fixtures: Clean and polish fixtures immediately prior to final inspection or Owner's occupancy. Clean floor drain grates; check each fixture to insure against trap stoppage.

3.14 LUBRICATION

- A. Upon completion of the work and before turning over to the Owner, clean and lubricate all bearings except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

3.15 PAINTING

- A. Properly prepare work under this Division to be finish painted under SECTION 09 91 00, "PAINTING".
- B. Paint duct black behind grilles and diffusers where duct is visible.
- C. Paint exterior wall cap, and louver to match wall color or coordinate with architect before installation.

3.16 COMPLETION

- A. Before Final Review: The work hereunder will not be reviewed for final acceptance until Operating and Maintenance Data, Manufacturer's Literature, Valve Directories, Piping Identification Code Directory and name plates specified herein have been approved and properly posted in the building and final cleaning has been completed.
- B. Demonstration of Operations: When the installation is complete and adjustments specified herein have been made, operate the systems for a period of one week, during which time demonstrate to the Architect that systems are completed and operating in conformance with these specifications.

END OF SECTION

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SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions, Special Conditions, Division 1 - General Requirements, and Section 23 05 00 are hereby made a part of this Section as if repeated herein.

1.2 SECTION INCLUDES

- A. Air systems.

PART 2 - PRODUCTS - not used

PART 3 - EXECUTION

3.1 QUALIFICATION

- A. Balancing to be performed by independent balancing specialty firm.
- B. Certified member of Associated Air Balancing Council (AABC), in accordance with AABC guide and recommendations or
- C. Certified member of National Environmental Balance Bureau (NEBB), in accordance with NBBC performance and techniques and
- D. Follow recommended procedures by ASHRAE and SMACNA.
- E. Shall be under the direct supervision of the general contractor. Shall adjust and re-adjust this part of the work until the operation complies with the requirements of the drawings and specifications.

3.2 COORDINATION

- A. Coordinate required locations of duct test openings during construction period.
- B. Provide all necessary action and coordination with regard to ACCEPTANCE TESTING as outlined in Specification Section 23 05 00.

3.3 PROCEDURES - PRECONSTRUCTION PLAN CHECK & REVIEW

- A. Use instruments accurately calibrated and maintained in good working order. If requested, conduct tests in the presence of a representative of the Architect and/or a representative of the Owner.
- B. General: Submit to the Architect the following in accordance with conditions of the Contract and Division 1 specification sections.

1. Review the project documents and contractor submittals for their effect on the test and balance process and overall performance of the HVAC system.
2. Review location and type of volume dampers in the air distribution system.
3. Review inlet conditions to HVAC equipment.
4. Review locations, type and size of balancing valves, and automatic control valves in the water flow system.
5. Review location of pressure sensors in the air and water distribution systems.
6. Review automatic control systems as they affect the test and balance procedure and the final Acceptance Testing.

3.4 PROCEDURES - ONGOING JOB SITE INSPECTIONS

- A. During construction, the balancing agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times. (Typically this is performed when 60% of the duct work is installed and again when 90% of the total system is installed and prior to insulation of the piping.)
- B. The balancing agency shall submit a written report (3 copies) of each inspection to the Owner's representative, the consultant and the contractors responsible for correcting noted deficiencies.
- C. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer well, etc.) to determine if they are installed properly and readily accessible.
- D. Identify and evaluate any variations from system design.
- E. Identify and report possible restriction in systems (closed fire dampers, poorly designed duct fittings, etc.).
- F. Notify HVAC contractor of air or water system performance deficiencies by the test before balancing the system.
- G. Beginning of work means of acceptance existing conditions.

3.5 AIR SYSTEM TEST & BALANCE PROCEDURES

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers.
- E. Vary total system air quantities first by adjustment of fan speeds. Provide drive changes as required. Vary branch air quantities by damper regulation as secondary adjustment.
- F. Balancing and adjusting air systems:
 1. Perform the following tests, compile information and submit on report form with suitable cover, index, etc.
 2. Air balance shall be performed with filters partially blocked to simulate a 90 percent loading of filters.

3. Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements. Make any changes in pulley sheave, belts, and dampers or add dampers necessary to correct balance at no additional cost to owner.
4. Current & Voltage: Measure and record motor current and voltage.
5. Pitot Tube Traverse: Perform a Pitot tube traverse of main supply and return ducts to obtain total CFM. If a Pitot tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation of why a traverse was not made must appear on the appropriate data sheet.
6. Outside Air: Test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperature. Make allowances for heat of compression and motor heat where applicable.
7. Static Pressure: Test and record system static pressures, including suction and discharge static pressure profile of each fan.
8. Air Temperature: Take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on the entering and leaving side of each heating coil and gas heater.
9. Zone Ducts (Supply & Return): Adjust zone ducts to within design CFM requirements.
10. Main Ducts: Adjust main ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
11. Branch Ducts: Adjust branch ducts to within design CFM requirements.
12. Tolerance: Test and balance each diffuser, grille, and register to within plus or minus 5 percent of design requirement.
13. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
14. Description: Record the size and type of each diffuser, grille, and register on air outlet data sheets.
15. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.
16. Exhaust, Supply and Transfer Fans.
 - a. Measure fan static pressures, total CFM, makeup air and fan RPM.
 - b. Measure motor operating voltage and amperage.
17. Record the specified, against the actual, supplied horsepower and electrical characteristics of all motors.
18. Verify capacities of all A.C. systems, make-up air units, and supply transfer and exhaust fans.

3.6 CONTROL SYSTEMS VERIFICATION

- A. Verify that all control devices are properly connected.
- B. Verify that all dampers, and other controlled devices are operated by the intended controller.
- C. Verify that all dampers are in the position indicated by the controller (open, closed or modulating).
- D. Verify the integrity of dampers in terms of tightness of close-off and full-open positions.
- E. Check the location of all thermostats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
- F. Check the sequence of operation that any control mode is in accordance with approved shop drawings.
- G. Verify that all controller set points meet the design intent.

- H. Check all dampers for free travel.
- I. Verify the operation of all interlock systems.
- J. Perform all system verification to assure the safety of the system and its components.

3.7 SYSTEM PERFORMANCE VERIFICATION

- A. At the time of final inspection, the Test and Balance (TAB) Agency shall recheck, in the presence of the Owner's Representative, specific and random selection of data, air quantities, and air motion recorded in the Certified Report.
- B. Points and areas for recheck shall be selected by the Owner's Representative.
- C. Measurement and test procedures shall be the same as approved for work forming a basis of Certified Report.
- D. Selections for recheck, specific plus random, will not normally exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.
- E. If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Certified Report listings, by ten percent or more of the selected recheck stations, the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspections tests made, all at no additional cost to Owner.
- F. Following system verification of the Certified Report by the Owner's Representative, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the TAB Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.

3.8 RECORDS

- A. Keep continuous record of all test reading and submit three (3) copies of typewritten balancing reports upon completion. Submit floor plan indicating location of all measurements including terminal units, air outlets, and fans.
- B. Upon completion of the work, submit all records and certifications approving the testing requirements to the Architect before final payment is made.
- C. Defective work or material replaced or repaired, as necessary and the inspection and test repeated. Repairs made with new materials. No caulking of screwed joints or holes will be acceptable.
- D. No part of any work shall be covered until after it is inspected, tested and approved.

END OF SECTION

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SECTION 23 07 00

MECHANICAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Field applied insulation for thermal efficiency and condensation control for HVAC, piping systems (HVAC), ductwork and equipment.
- B. Refer to Section 22 00 00 for insulation of Plumbing Piping.
- C. Definitions:
 - 1. Air conditioned space: Space directly supplied with heated or cooled air.
 - 2. ASJ: All service jacket, white finish facing or jacket.
 - 3. Cold: Equipment, ductwork or piping handling media at design temperature of 60°F or below.
 - 4. Concealed: Ductwork and piping above ceilings and in chases, interstitial space, and pipe spaces.
 - 5. Conditioned Space: A room area which is heated or cooled.
 - 6. Exhaust Duct: A duct transporting air from one or more rooms only to the out-of-doors.
 - 7. Exposed: Piping, ductwork, and equipment exposed to view in finished areas including mechanical and electrical equipment rooms. Attics and crawl spaces where air handling units are located are considered to be mechanical rooms. Shafts, chases, interstitial spaces, unfinished attics, crawl spaces and pipe basements are not considered finished areas.
 - 8. FSK: Foil-scrim-kraft facing.
 - 9. Hot: Ductwork handling air at design temperature above 60°F; equipment or piping handling media above 105°F.
 - 10. Return Duct: A duct transporting air from one or more rooms toward fan if such air can be, at any time, circulated back to any rooms.
 - 11. Run-outs: 2" maximum pipe size and 12 feet maximum branch length connection to individual equipment.
 - 12. Thermal conductance: Heat flow rate through materials.
 - a. Flat surface: BTU per hour per square foot.
 - b. Pipe or cylinder: BTU per hour per linear foot.
 - 13. Thermal conductivity ('k'): BTU per inch thickness, per hour, per square foot, per degree Fahrenheit temperature difference.
 - 14. Transfer duct: A duct transporting air from one or more rooms to another room or rooms.
 - 15. Unconditioned Space: A room or area which is neither heated nor cooled.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00, GENERAL MECHANICAL PROVISIONS.
- B. Section 22 00 00, PLUMBING
- C. Section 23 23 00, REFRIGERANT PIPING
- D. Section 23 31 00, DUCTWORK AND ACCESSORIES
- E. Section 23 74 33, PACKAGED AIR CONDITIONING UNIT.

1.3 REFERENCES

- A. ASTM C518 - Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- C. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- D. ASTM E84 - Surface Burning Characteristics of Building Materials.
- E. ASTM E96 - Water vapor Transmission of Materials.
- F. CMC – California Mechanical Code.
- G. NFPA 90A - Installation of Warm Air Heating and Air Conditioning Systems.
- H. NFPA 255/UL 723 - Surface Burning Characteristics of Building Materials.
- I. USGBC – U.S. Green Building Council.

1.4 CRITERIA

- A. Comply with NFPA 90A, particularly paragraphs 2-1.3; 2-2; and 3-3.8, parts of which are quoted as follows:
 - 1. "2-1.3.1 Duct coverings, duct linings, vapor barrier facings, tapes, and core materials in panels used in duct system shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating not higher than 50. If coverings and linings are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating no higher than 50 when in the final dry state."
 - 2. "2-1.3.6 Pipe insulation and coverings shall meet the requirements of 2-2.1.2(a) when installed in ducts, plenums, or concealed spaces used as part of the air distribution system."
 - 3. "2-2.1.2(a) All materials exposed to the air flow shall have smoke developed ratings not greater than 50 and be non-combustible or limited combustible."
 - 4. "3-3.8.1 Where ducts pass through walls, floors, or partitions required to have a fire resistance rating and fire dampers are not required, the opening in the construction around the duct shall not exceed one inch (2.54 cm) average clearance on all sides and shall be filled solidly with an approved material capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the same NFPA 255 time-temperature fire conditions required for fire barrier penetration." (Note: By NFPA 101, 6-2.3.4 and 6-3.6, this requirement applies to pipe penetrations of fire or smoke barriers also.)
- B. Test methods: ASTM E84, UL 723, or NFPA 255.
- C. Specified 'k' factors are at 75°F mean temperature unless stated otherwise. Where optional thermal insulation material is used, select thickness to provide thermal conductance no greater than that for the specified material. For pipe, use insulation manufacturer's published heat flow tables. For domestic hot water supply and return, run out insulation and condensation control insulation, no thickness adjustment need be made.
- D. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.

- E. Underwriters Laboratories, Inc., label or listing, or satisfactory certified test report from an approved testing laboratory will be required to show that surface burning characteristics for materials to be used do not exceed specified ratings.
- F. Lining materials installed within ducts shall have mold, humidity and erosion resistant surface that meet the requirements of CMC 605.0, ASTM C 1104 and ASTM C 1071 for surface erosion resistance.
- G. General: All insulating material required for piping, mechanical equipment and duct work etc., shall be furnished and installed under this Section of the specifications. The execution of the work shall be in strict accordance with Title 24, Energy Conservation Standards and the best practice of the trade and the intent of this specification. All insulation shall be UL listed and shall meet all code requirements.
- H. Surface burning characteristics:
 - 1. Flame spread.....25
 - 2. Smoke developed.....50
- I. Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.
- J. Acceptable Manufacturers:
 - 1. Fiberglass Insulation: Owens-Corning Fiberglas, CertainTeed, Knauf.
 - 2. Flexible Elastomeric: Armstrong, Halstead, IMOCA, or Rubatex.
 - 3. Fiberglass Premolded Pipe Fitting Covers: Insul-Coustic/Birma Corp., Childers, Speedline, or Zeston.
 - 4. Adhesives and Cements: Armaflex Low VOC Spray Contact Adhesive by Armacell.
 - 5. Weld Pins: Nelson Stud Welding Div. TRW Inc. Duro Dyne Corp., Tuff-Weld, or Grip Nail.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.
- C. Manufacturer's products for insulation, adhesives and caulk shall be listed by the USGBC.

1.6 SUBMITTALS

- A. Manufacturer's Literature and Data:
 - 1. Insulation materials: Each type used. State surface burning characteristics.
 - 2. Insulation listings for all required Standards Listing.
 - 3. Insulation facings and jackets: Each type used. Make it clear that white finish will be furnished for exposed ductwork, casings and equipment.
 - 4. Insulation accessory materials: Each type used.
 - 5. Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.
 - 6. Make reference to applicable specification paragraph numbers for coordination.

PART 2 - PRODUCTS

2.1 PIPE INSULATION

- A. Elastomeric Foam: ASTM C534; closed cell, Microban antimicrobial, fiber free flexible elastomeric foam in tubular form.
 - 1. 'K' ('ksi') Value: 0.25 at 75°F mean temperature.
 - 2. Application: Refrigerant liquid and suction lines, and any other piping below 40°F.
 - 3. Built-in vapor retardant barrier.
 - 4. UV-resistance white color insulation.
 - 5. Connection: reinforced lap seal.
- B. Inserts:
 - 1. Insulation inserts at pipe supports: Provide for all insulated piping. Install with metal insulation shields furnished with pipe supports, Section 23 05 00 - General Mechanical Provisions.
 - 2. Material: Premolded, high density mineral fiber blocks, minimum density 20 lb/ft³, of same thickness as adjacent insulation.
 - 3. Up through 5 inch pipe use 6 inch long insert Blocks.
 - 4. Optional insert material: 180 degree segment of calcium silicate, or 9 lb/ft³ minimum density of cellular glass or mineral fiber.

2.2 JACKETS

- A. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 - e. Line-Hide by Mitsubishi.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White or Off-white.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.3 DUCTWORK & PLENUM INSULATION

- A. Flexible Glass Fiber: ASTM C653; flexible, non-combustible blanket.
 - 1. 'K' ('ksi') Value: ASTM C518, 0.48 at 75°F.
 - 2. Density: 0.75 lb/ft³.
 - 3. Maximum service temperature: 250°F.
 - 4. Thickness: 1-1/2" unless otherwise specified.
 - 5. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film vinyl, secured with pressure sensitive tape. Moisture vapor transmission: ASTM E96; 0.5 perm.
 - 6. Tie Wire: Annealed steel, 16 gauge.
- B. Duct Liner: ASTM C553; flexible, non-combustible blanket.
 - 1. 'K' ('ksi') Value: ASTM C518, 0.24 at 75°F.
 - 2. Density: 1.5 lb/ft³ minimum.
 - 3. Maximum service temperature: 250°F.
 - 4. Thickness: 1" standard, 2" where indicated on plans.
 - 5. Maximum Velocity on Coated Air Side: 4,000 ft/min.
 - 6. Adhesive: Waterproof, fire retardant type.
 - 7. Liner Fasteners: Galvanized steel anchor pins with speed washers.

8. Adhesives and Sealants: UL listed or classified. Type 1 per Adhesive and Sealant Council Standard ASCC-A-7001 and listed by the USGBC.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Required pressure tests and connections shall be completed and the work approved by the owner or owners representative before application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.
- B. Apply covering (jackets) after pipes, ducts and equipment have been tested and proven tight.
- C. Except for specific exceptions, insulate entire specified equipment, piping, (pipe, fittings, valves, accessories) and duct systems. Insulate each pipe and duct individually. Do not use scrap pieces of insulation where a full length section will fit.
- D. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor barriers shall be continuous and uninterrupted throughout systems with operating temperature 60°F and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of six inches.
- E. Insulation on piping shall be terminated square at items not to be insulated, access openings and nameplates. Cover all exposed raw insulation with white sealer or jacket material.
- F. HVAC work not to be insulated:
 1. Internally insulated ductwork and exhaust air except where otherwise designated.
 2. In hot piping: Unions and flexible connectors. Insulate piping to within approximately three inches of un-insulated items.
 3. Do not internally line exhaust ducts serving kitchen or dishwasher hoods or vapor laden ducts.
- G. Apply insulation materials subject to the manufacturer's recommended temperature limits.

3.2 INSTALLATION

- A. Installation: In absence of specified installation requirements follow manufacturer's published recommendations.
- B. Continue insulation vapor barrier through penetrations.
- C. Piping Insulation:
 1. Locate insulation and cover seams in least visible locations.
 2. Neatly finish insulation at supports, protrusions, and interruptions.
 3. Provide insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature with vapor barrier jackets. Finish with glass cloth and vapor barrier adhesive. Insulate complete system.
 4. For insulated pipes conveying fluids above ambient temperature, provide standard jackets. Bevel and seal ends of insulation at equipment, flanges, and unions.

5. Provide insert between support shield and piping on piping 2 inches diameter or larger.
 6. For pipe exposed to weather, in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers.
 7. Butt edges neatly.
 8. Fill voids with insulating cement.
 9. Continue insulation passing through sleeves or other openings.
 10. Insulate fittings with pre-molded fiberglass fitting covers or molded Fiberglas or Owens corning No. 10 insulating cement or equal thickness to that of adjoining insulation and finished with a one-piece fireproof polyvinyl chloride fitting cover.
 11. Valves, fittings, flanges and accessory insulation:
 - a. Valves, including bonnets.
 - b. Flanges
 - c. Fittings
 - d. Strainers
 - e. Expansion joints
 - f. Specialties
- D. Flexible Elastomeric Cellular Thermal insulation:
1. Apply insulation and fabricate fittings in accordance with manufacturer's installation instructions.
 2. Pipe and tubing insulation:
 - a. Use proper size material. Do not stretch or strain insulation.
 - b. To avoid undue compression of insulation, provide cork stoppers or wood inserts at supports as recommended by the insulation manufacturer.
 - c. Where possible, slip insulation over the pipe or tubing prior to connection, and seal the butt joints with adhesive. Where the slip-on techniques are not possible slit the insulation and apply it to the pipe sealing the seam and joints with contact adhesive. Optional tape sealing as recommended by the manufacturer, may be employed. Make changes from mineral fiber insulation in a straight run of pipe, not at a fitting. Seal joint with tape.
 3. Other applications: Apply sheet insulation to flat or large curved surfaces with 100% adhesive coverage. Adhere the seams only for fittings and large pipe.
 4. Outdoor installation: Provide PVC jacketing.
- E. External Ductwork Insulation:
1. Secure with 4" strips of adhesive, 8" on center.
 2. For rectangular ducts 24" and wider, secure to bottom of duct with mechanical fasteners 18" on center.
 3. Wrap with 18 gauge galvanized wire, 18" on center.
 4. Adhesive requirements same as for duct liner.
 5. Provide insulated ductwork conveying air below ambient temperature with vapor barrier jacket. Finish with tape. Seal vapor barrier penetrations with vapor barrier adhesive.
 6. Provide insulated ductwork conveying air above ambient temperature with or without standard vapor barrier jacket. Where service access is required, bevel and seal ends of insulation.
 7. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 8. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging.
 9. For ductwork exposed in mechanical equipment rooms or in finished spaces, finish with aluminum jacket.
 10. For exterior ductwork with external insulation provide aluminum jacket sealed watertight with caulk.
- F. Duct Liner:
1. Secure liner with adhesive for 100% coverage, anchor pins and speed washers. Refer to SMACNA Duct Liner Application Standards for installation.
 2. Seal liner surface penetrations with adhesive.

3. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for liner thickness.
4. Surface adjacent to air flow, including at joints, shall be uniformly flat.
5. Seal butt joint edges of liner to prevent erosion. For rectangular ducts provide sheet metal end caps to cover liner edges at entering and leaving edges of lined duct section; for round ducts use low velocity duct sealant. For plenum lining, provide sheet metal caps at exposed edges, e.g., where liner terminates at access door.

3.3 PIPING INSULATION SCHEDULE

Code	System Fluid Temp (°F)	Nominal Pipe diameter (in inches)					
		Run-outs	1" & Less	1-1/4 - 2"	2-1/2 - 4"	5-6"	8" & Larger
		Minimum insulation thickness, inches					
II	40 - 60	1/2	1/2	1/2	1	1	1

- A. System Codes and Insulation Types: Provide elastomeric insulation on refrigerant pipes.
 1. Code II: Refrigerant suction and liquid piping.
- B. Notes for Piping Insulation Schedule
 1. Where systems are scheduled, insulate supply and return piping.
 2. Fluid temperature means specified supply temperature.

3.4 DUCTWORK INSULATION SCHEDULE

SERVICE	SUPPLY	RETURN	EXHAUST
In Mechanical and Fan Rooms	DL	DL	DL
Within 10' or 10 duct diameters of fan, whichever is greater	DL	DL	DL
Concealed between roof and ceiling	WV	W	--
Out of doors unless otherwise noted	DL	DL	--
Concealed in shaft adjacent To unconditioned space or building exterior	WV	W	--
Other concealed	WV	--	--
Exposed within space	--	--	--
Return and exhaust stub ducts from ceiling plenum into shafts	--	--	--

- A. Notes for Duct Insulation Schedule:
 1. Abbreviations:
 - a. DL Duct Liner
 - b. W Flexible Glass Fiber Duct wrap without vapor barrier
 - c. WV Flexible Glass Fiber Duct wrap with vapor barrier
 2. Where lining is specified, other insulation is not required.
 3. Where lining is specified in ducts or shafts constructed of architectural materials, apply plenum lining to such materials.
 4. Where round ducts are specified to be lined, use one of the following methods:
 - a. Line ducts as specified.
 - b. Provide pre-insulated duct or approved equal.
 - c. Where space permits and where permitted by Architect, provide equivalent size lined rectangular ducts (based on equal friction) in lieu of lined round ducts.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- B. Insulated Piping:

1. Specify parts in first three subparagraphs below as galvanized or painted, as required. Other materials are available in place of wooden blocks.
2. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
3. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
5. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
6. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

END OF SECTION

08/27/18

SECTION 23 09 00

HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 GENERAL

- A. Furnish an Alerton Envision for BACtalk EMS system to meet District EMS standards. System shall be a native-BACnet system and shall be based on a distributed control system in accordance with this specification. The operator's workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2001, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used for communication to controllers installed under this section. Gateways may be used for communication to existing systems or to systems installed under other sections.
- B. Coordination Meeting: The Installer furnishing the DDC network shall meet with the Installer(s) furnishing each of the following products to coordinate details of the interface between these products and the DDC network. The Owner or his designated representative shall be present at this meeting. Each Installer shall provide the Owner and all other Installers with details of the proposed interface including PICS for BACnet equipment, hardware and software identifiers for the interface points, network identifiers, wiring requirements, communication speeds, and required network accessories. The purpose of this meeting shall be to insure there are no unresolved issues regarding the integration of these products into the DDC network. Submittals for these products shall not be approved prior to the completion of this meeting
- C. Communications with Third Party Equipment: Any additional integral control systems included with the products integrated with the work of this section shall be furnished with a BACnet interface for integration into the Direct Digital Control System described in this section.
- D. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications.
- E. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
- F. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
- G. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.
- H. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.
- I. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
- J. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

1.2 RELATED WORK IN OTHER SECTIONS

- A. Refer to Division 00 and Division 01 for related contractual requirements.
- B. Refer to Section 23 05 00 for General Mechanical Provisions.
- C. Refer to Section 26 05 00 for Basic Electrical Materials and Methods.

1.3 REFERENCE STANDARDS

- A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:
 - 1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
 - 2. ANSI/ASHRAE Standard 135-2001, BACnet.
 - 3. Uniform Building Code (UBC), including local amendments.
 - 4. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
 - 5. National Electrical Code (NEC).
 - 6. FCC Part 15, Subpart J, Class A.
- B. City, county, state, and federal regulations and codes in effect as of contract date.

1.4 SUBMITTALS

- A. Drawings:
 - 1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.
 - 2. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).
 - 3. Eight complete sets (copies) of submittal drawings shall be provided.
 - 4. Drawings shall be available on CD-ROM.
- B. System Documentation Include the following in submittal package:
 - 1. System configuration diagrams in simplified block format.
 - 2. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
 - 3. Complete bill of materials and valve schedule.
 - 4. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.

1.5 QUALITY ASSURANCE

- A. Responsibility: The supplier of the EMCS shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished.
- B. Component Testing: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every controller, sensor, and all other DDC components shall be individually tested by the manufacturer prior to shipment.
- C. Tools, Testing and Calibration Equipment: The EMCS supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the system.
- D. The systems control contractor shall have been in business as a controls contractor a minimum of five years, be able to verify successful installation and completion of at least

five other projects similar in size and nature to this current project, and be the authorized installing contractor for the manufacturer of the BACnet components.

- E. Control system shall be engineered, programmed and supported completely by representative's local office that must be within 75 miles of project site.

1.6 WARRANTY

- A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance.
- B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours Monday through Friday, 48 hours on Saturday and Sunday.
- C. This warranty shall apply equally to both hardware and software.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Automatic Logic Corporation Version 6.0 or later (No Equal).

2.2 SYSTEM DESCRIPTION

- A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- B. The system shall directly control HVAC equipment as specified in the control diagram sheet 3-M0.6 (Sequence of Operation). Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of set-points as specified in the Sequence of Operation.
- C. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.
- D. All application controllers for every terminal unit (VAV, HP, UV, etc.) air handler, all central plant equipment, and any other piece of controlled equipment shall be fully programmable. Application controllers shall be mounted next to controlled equipment and communicate with building controller via BACnet LAN.
- E. Room sensors (where applicable) shall be provided with digital readout that allow the user to view room temperature, view outside air temperature, adjust the room setpoint within preset limits and set desired override time. Include all necessary wiring and firmware such

that room sensor includes field service mode. Field service mode shall allow technician to balance VAV zones and access any parameter in zone controller.

- F. Provide for future system expansion to include monitoring of occupant card access, fire alarm, and lighting control systems.
- G. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. Schedules, setpoints, trends, and alarms specified in Control diagram sheet 3-M0.6 (Sequence of Operation) shall be BACnet objects

2.3 SYSTEM PERFORMANCE

- A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).
 1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
 2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.
 3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
 4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
 5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.
 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
 7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
 8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
 9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
 10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1
Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C (±1°F)
Ducted Air	±0.5°C (±1°F)
Outside Air	±1.0°C (±2°F)
Dew Point	±1.5°C (±3°F)
Water Temperature	±0.5°C (±1°F)
Delta-T	±0.15°C (±0.25°F)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale

Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Dioxide (CO ₂)	±50 ppm

Note 1: Accuracy applies to 10% - 100% of scale

Note 2: For both absolute and differential pressure

Note 3: Not including utility-supplied meters

Table 2
Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±0.2 in. w.g. ±0.01 in. w.g.	0-6 in. w.g. 0.1 to 0.1 in. w.g.
Airflow	±10% of full scale	
Space Temperature	±2.0°F	
Duct Temperature	±3°F	
Humidity	±5% RH	

2.4 MATERIALS

- A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract

2.5 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.
- B. Install new wiring and network devices as required to provide a complete and workable control network. Project drawings indicate remote buildings or sites to be connected by a nominal 56,000 baud modem over voice-grade telephone lines. In each remote location a modem and field device connection shall allow communication with each controller on the internetwork as specified in Paragraph D.
- C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 - 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
 - 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Control diagram sheet 2-M0.6. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

- E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.
- F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.
- G. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization (WS-I) Basic Profile 1.0 or higher. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.
 - 1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.
 - 2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.
 - 3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.
 - 4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third party Web services device to read data from or write data to any object in the system which supports this service.

2.6 OPERATOR INTERFACE

- A. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information.
- B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J.
- C. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:
 - 1. Log In and Log Out. System shall require user name and password to log in to operator interface.
 - 2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.
 - 3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.
 - 4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.
 - 5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.
 - 6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.
8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.
9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

D. SYSTEM SOFTWARE.

1. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract.
 - a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
 - b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
 - c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
 - d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Adobe Flash).

E. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
3. System Configuration. Operators shall be able to configure the system.
4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.
5. Security. System shall require a user name and password to view, edit, add, or delete data.
 - a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.
 - b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
 - c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).
7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.
9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.
11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Trends shall be BACnet trend objects.
12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
14. Standard Reports. Furnish the following standard system reports:
 - a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
 - b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
 - c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:
 - 1) Alarm History.
 - 2) Trend Data. Operator shall be able to select trends to be logged.
 - 3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.
15. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
16. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.
17. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.
18. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs

are edited, compiled, and downloaded. Programming language shall have the following features:

- a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.
 - b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
 - c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
 - d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
 - e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
 - g. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.
 - 1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and
 - 2) System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.
- F. Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.
- G. Operator Workstation: Web server or workstation shall conform to BACnet Operator Workstation (B-OWS) device profile or BACnet Advanced Workstation (B-AWS) as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-OWS or B-AWS in the BACnet Testing Laboratories (BTL) Product List.

2.7 CONTROLLER SOFTWARE

- A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.
- B. System Security. See Paragraph 2.6.E.5 (Security) and Paragraph 2.6.E.14.c(3) (Operator Activity).

- C. Scheduling. See Paragraph 2.6.C.4 (View and Adjust Operating Schedules). System shall provide the following schedule options as a minimum:
 - 1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
 - 2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.
 - 3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.
- D. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.
- E. Binary and Analog Alarms. See Paragraph 2.6.E.7 (Alarm Processing).
- F. Alarm Reporting. See Paragraph 2.6.E.9 (Alarm Reactions).
- G. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.
- H. Demand Limiting.
 - 1. System shall monitor building power consumption from building power meter pulse generator signals or from building feeder line watt transducer or current transformer.
 - 2. When power consumption exceeds adjustable levels, system shall automatically adjust setpoints, de-energize low-priority equipment, and take other programmatic actions to reduce demand. When demand drops below adjustable levels, system shall restore loads as specified.
- I. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits.
- J. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.
- K. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
- L. Energy Calculations:
 - 1. System shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.
 - 2. System shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.
- M. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.
- N. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.
- O. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit.

2.8 CONTROLLERS

- A. General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 23 0900 Article 1.9 (System Performance). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.
- B. BACnet:
1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
 2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
 3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
 4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
 5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
 6. BACnet Communication:
 - a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 - c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.
- C. Communication:
1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
 2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
 3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
 4. Stand-Alone Operation. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide

stable and reliable stand-alone control using default values or other method for values normally read over the network.

- D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
 - 1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
 - 2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.
- F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.
- G. Serviceability:
 - 1. Controllers shall have diagnostic LEDs for power, communication, and processor.
 - 2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
 - 3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
- H. Memory:
 - 1. Controller memory shall support operating system, database, and programming requirements.
 - 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
 - 3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.
- I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.9 INPUT AND OUTPUT INTERFACE

- A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
- B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.
- C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.
- D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

- E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
- G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
- H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.
- I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.10 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
 - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
 - a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
 - b. Line voltage units shall be UL recognized and CSA listed.
- B. Power Line Filtering:
 - 1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:
 - a. Dielectric strength of 1000 V minimum
 - b. Response time of 10 nanoseconds or less
 - c. Transverse mode noise attenuation of 65 dB or greater
 - d. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.11 AUXILIARY CONTROL DEVICES

- A. Motorized Control Dampers:
 - 1. Type. Control dampers shall have linear flow characteristics and shall be parallel- or opposed-blade type as specified below or as scheduled on drawings.
 - a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.
 - b. Other modulating dampers shall be opposed-blade.
 - c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.

2. Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (1/8 in.) extruded aluminum with reinforced corner bracing.
 3. Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).
 4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.
 5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s·m² (10 cfm per ft²) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).
 6. Sections. Damper sections shall not exceed 125 cm - 150 cm (48 in. - 60 in.). Each section shall have at least one damper actuator.
 7. Linkages. Dampers shall have exposed linkages.
- B. Electric Damper and Valve Actuators:
1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.
 2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).
 3. Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
 4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
 5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.
- C. Binary Temperature Devices:
1. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
 2. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
 3. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.
- D. Temperature Sensors:
1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
 2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m²(10 ft²) of duct cross-section.
 3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
 4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.

5. Differential Sensors. Provide matched sensors for differential temperature measurement.
- E. Flow Switches: Differential pressure type (air service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).
 1. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.
- F. Relays:
 1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
 2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable $\pm 100\%$ from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.
- G. Override Timers:
 1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.
- H. Current Transmitters:
 1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
 2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
 3. Unit shall be split-core type for clamp-on installation on existing wiring.
- I. Current Transformers:
 1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
 2. Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.
 3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.
- J. Voltage Transmitters:
 1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.
 2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
 3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.
- K. Voltage Transformers:
 1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
 2. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide $\pm 0.5\%$ accuracy at 24 Vac and 5 VA load.
 3. Windings (except for terminals) shall be completely enclosed with metal or plastic.
- L. Power Monitors:

1. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.
 2. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of $\pm 2\%$ at 1.0 power factor or $\pm 2.5\%$ at 0.5 power factor.
- M. Current Switches:
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.
- N. Pressure Transducers:
1. Transducers shall have linear output signal and field-adjustable zero and span.
 2. Continuous operating conditions of positive or negative pressure 50% greater than calibrated span shall not damage transducer sensing elements.
 3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4-20 mA output, suitable mounting provisions, and block and bleed valves.
 4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer shall have 4-20 mA output, suitable mounting provisions, and 5-valve manifold.
- O. Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.
- P. Pressure-Electric (PE) Switches: PE switches shall be UL listed, pilot duty rated (125 VA minimum) or motor control rated, metal or neoprene diaphragm actuated, operating pressure rated for 0-175 kPa (0-25 psig), with calibrated scale minimum setpoint range of 14-125 kPa (2-18 psig).
1. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required by application.
 2. Switches shall be open type (panel-mounted). Exception: Switches shall be enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.
 3. Each pneumatic signal line to PE switches shall have permanent indicating gauge.
- Q. Local Control Panels:
1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.
 2. Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.
 3. Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

2.12 WIRING AND RACEWAYS

- A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.
- B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

PART 3 - EXECUTION

3.1 INSTALLATION (GENERAL)

- A. Install in accordance with manufacturer's instructions.
- B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.2 LOCATION AND INSTALLATION OF COMPONENTS

- A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3'-0" clear access space in front of units.
- B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.
- C. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections—sized to suit pipe diameter without restricting flow.

3.3 INTERLOCKING AND CONTROL WIRING

- A. All wiring shall be installed neatly and professionally, in accordance with all national, state and local electrical codes.
- B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.
- C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.
- D. Provide auxiliary pilot duty relays on motor starters as required for control function.
- E. All control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. Plenum rated cable without conduit may be used in concealed but accessible locations provided it is installed in a neat and inconspicuous manner per local code requirements.

3.4 TRAINING

- A. Provide application engineer to instruct owner in operation of systems and equipment.
- B. Provide system operator's training to include such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of 2 persons.
- C. Provide on-site training above as required, up to 16 hours as part of this contract.

PART 4 - SEQUENCE OF OPERATIONS

4.1 GENERAL

- A. Provide a complete and operational temperature control and building automation system based on the following points and sequence of operation in the specification drawings. The system shall be complete as to sequences and standard control practices
- B. BACnet Object List:
 - 1. The following points as defined for each piece of equipment are designated as follows:
 - a. Digital Out (DO): Defined as any two-state output (start/stop), (enable/disable), etc.
 - b. Digital In (DI): Defined as any two-state input (alarm, status), etc.
 - c. Analog Out (AO): Defined as any electrical variable output. 0-20mA, 4-20mA and 0-10VDC are the only acceptable analog outputs. The driver for analog outputs must come from both hardware and software resident in the controllers. Transducers will not be acceptable under any circumstances.
 - d. Analog In (AI): Defined as any variable input (temperature), (position), (pressure), etc.

END OF SECTION

08/27/18

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Refrigerant piping to connect outdoor condensing or heat pump units to indoor fan coils.

1.2 RELATED WORK

- A. Section 23 05 00, GENERAL MECHANICAL PROVISIONS.
- B. Section 23 07 00, MECHANICAL INSULATION.

1.3 QUALITY ASSURANCE

- A. Sections 23 05 00, GENERAL MECHANICAL PROVISIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, "SUBMITTALS".
- B. Manufacturer's Literature and Data:
 - 1. Pipe and equipment supports.
 - 2. Pipe and tubing, with specification, class or type, and schedule.
 - 3. Pipe fittings, including miscellaneous adapters and special fittings.
- C. Coordination Drawings: Refer to Section 23 05 00, GENERAL MECHANICAL PROVISIONS.
- D. As-Built Piping Diagrams:
 - 1. One set of reproducible drawings.

PART 2 - PRODUCTS

2.1 PIPE AND EQUIPMENT SUPPORTS

- A. Provide in accordance with Section 23 05 00, GENERAL MECHANICAL PROVISIONS.

2.2 PIPE

- A. Piping material shall be as specified below for the services, locations and sizes called for except that other materials shall be provided where specifically noted on the drawings or elsewhere in the Specifications. Provide all refrigerant piping specialties with a maximum working pressure of full vacuum to 450 psig and a maximum working pressure of 225 deg F.
- B. Refrigeration Piping:

1. ACR copper tube, hard temper, cleaned, capped and dehydrated, piping shall be nitrogen charged. Fittings shall be wrought copper, silver brazed, and/or
 2. Pre-charged soft drawn copper of proper length. If using soft drawn copper, use the manufacturers' standard liquid line refrigerant specialties also.
 3. As an option, with manufacturer's and local building department acceptance, use ASTM B210 seamless drawn aluminum tubing, cleaned and capped in accordance with ASTM B280, and comply with ASME B31.5, with REFLOK steel fittings. If Aluminum tubing is substituted, the joints must be made without the use of heat. Any joint fitting must be UL or ETL listed and tested per UL-207 for joining refrigeration tubing using either copper or aluminum tubing. ETL tested and listed to UL 207 REFLOK fittings for joining copper to copper, aluminum to aluminum or aluminum to copper. Fittings shall be certified to a working pressure of 600 psi.
- C. Insulate Refrigerant Piping: Suction line with 1" thick closed cell insulation Armstrong, Armaflex or equal. Cover insulated refrigerant piping with Rectorseal Slimduct lineset cover.

PART 3 - EXECUTION

3.1 GENERAL

- A. The drawings show the general arrangement of pipe and equipment but do not show all required fittings and offsets that may be necessary to connect pipes to equipment, fan-coils, etc., and to coordinate with other trades. Provide all necessary fittings, offsets and pipe runs based on field measurements and at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories to be connected on ceiling grid. Pipe location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.
- B. All piping to be new, positively marked for field identification, and installed to allow for free expansion, including tight angle loops, cold springing or other satisfactory method. Lines and risers to be perfectly straight, plumb, true, properly graded and free from depression or pockets. Open ends of all piping to be kept closed during construction.
- C. Store materials to avoid excessive exposure to weather or foreign materials. Keep inside of piping relatively clean during installation and protect open ends when work is not in progress.
- D. Support piping securely. Refer to PART 3, Section 23 05 00, GENERAL MECHANICAL PROVISIONS.
- E. Offset equipment connections to allow valve off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line take-offs with 3-elbow swing joints where noted on the drawings.

3.2 LEAK TESTING

- A. Refrigerant piping shall be leak tested and comply with the manufacturer's recommendations.

3.3 REFRIGERANT SYSTEM CHARGING

- A. After testing: Follow manufacturer's recommended charging procedures for both refrigerant and refrigerant oil.

- B. Replace any refrigerant or oil from the system during the guarantee period at no expense to Owner.

END OF SECTION

08/27/18

SECTION 23 31 00

DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Ductwork.
 - 2. Volume dampers.
 - 3. Motorized damper
 - 4. Fire smoke damper
 - 5. Duct smoke detector
 - 6. Turning vanes.
 - 7. Flexible ducts.
 - 8. Duct accessory hardware.
 - 9. Duct Adhesives, Sealants, and Caulks
 - 10. Duct Cleaning.

1.3 SUBMITTALS

- A. Product data for the following:
 - 1. Volume dampers.
 - 2. Fire smoke damper
 - 3. Duct smoke detector
 - 4. Turning Vanes.
 - 5. Flexible ducts.
 - 6. Duct Sealants.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Special fittings.
 - 2. Manual-volume damper installations.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to the product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated on drawings and as herein specified.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A653 and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A480.
- D. Aluminum Sheets: ASTM B209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACK-DRAFT DAMPERS

- A. Manufacturers
 - 1. Air Balance, Inc.
 - 2. American Warming and Ventilating.
 - 3. CESCO Products.
 - 4. Duro Dyne Corp.
 - 5. Greenheck.
 - 6. Penn Ventilation Company, Inc.
 - 7. Prefco Products, Inc.
 - 8. Ruskin Company.
 - 9. Vent Products Company, Inc.
- B. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.
- C. Frame: 0.052-inch thick, galvanized sheet steel with welded corners and mounting flange.
- D. Blade Seals: Neoprene.
- E. Blade Axles: Galvanized steel.
- F. Tie Bars and Brackets: Galvanized steel.

- G. Return Spring: Adjustable tension.

2.4 VOLUME DAMPERS

- A. Manufacturers:
 - 1. Air Balance, Inc.
 - 2. American Warming and Ventilating.
 - 3. Flexmaster U.S.A., Inc.
 - 4. McGill AirFlow Corporation.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Penn Ventilation Company, Inc.
 - 8. Ruskin Company.
 - 9. Vent Products Company, Inc.
- B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
 - 1. Pressure Classes of 3-inch w.g. or higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- C. Standard Volume Dampers: single-blade design as indicated, standard leakage rating, with linkage outside air stream, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 - 2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
 - 3. Blade Axles: Galvanized steel.
 - 4. Bearings: Molded synthetic.
 - 5. Bars and Brackets: Galvanized steel.
- D. Jackshaft: One-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 DAMPER REGULATORS

- A. Manufacturers:
 - 1. Ventfabrics.
 - 2. Ventlock.
 - 3. Young.
- B. At accessible dampers, provide locking quadrant operators.
 - 1. Un-insulated ducts: Young No. 403.
 - 2. Insulated ducts: Young No. 403B
- C. At inaccessible dampers, provide with remote operators.
 - 1. Flush to Ceiling: Young 270-301-EZ mounting bracket for Bowden Cable Controls. Use with Young 5020CC round or 830ACC rectangular dampers OR 270-301-EZ-B kit for dampers furnished separately.
 - 2. Alternatively provide Young 270-275 for controller mounted in diffuser/register.

2.6 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers:
 - 1. Air Balance, Inc.
 - 2. CESCO Products.
 - 3. Greenheck.
 - 4. Nailor Industries Inc.
 - 5. Ruskin Company.
- B. General Description: Labeled according to UL 555S. Combination fire and smoke dampers shall be labeled according to UL 555 for 1-1/2-hour rating.
- C. Fusible Links: Replaceable, 212°F according to manufacturer's UL-approved written instructions.
- D. Frame and Blades: 0.064-inch thick, galvanized sheet steel.
- E. Mounting Sleeve: Factory-installed, 0.052-inch thick, galvanized sheet steel; length to suit wall or floor application.
- F. Integral Duct Smoke Detector: Factory mounted and wired "No Flow" Duct Smoke Detector with addressable relay. Photoelectric type with appropriate length sampling tubes. Unit shall be wired under Division 16 for power and alarm system.
- G. Damper Motors: Modulating and two-position action.
 - 1. Comply with requirements in Division 15 Section "Motors."
 - 2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 3. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 4. Electrical Connection: 115 V, single phase, 60 Hz.

2.7 DUCT MOUNTED SMOKE DETECTORS

- A. Duct type smoke detectors: Photoelectric type with appropriate length sampling tubes. Units shall be furnished and installed in air ducts by mechanical contractor, where indicated on the mechanical drawings. Pyrotonics AD-3XRILP with auxiliary contacts rated at 1 amp @ 120 VAC. Unit shall be wired under Division 16 for power and alarm system. Control wiring furnished and installed under Division 15.

2.8 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
- B. Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, [single] [double]-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.
 - 1. Available Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Duro Dyne Corp.
 - c. METALAIR, Inc.
- C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

1. Airsan Acoustiturn or equal.

2.9 FLEXIBLE CONNECTORS

- A. Available Manufacturers:
 1. Ductmate Industries, Inc.
 2. Duro Dyne Corp.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.
- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip **3-1/2 inches** wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel. Select metal compatible with ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd.
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200°F.
- E. Service Temperature: Minus 67 to plus 500°F.

2.10 FLEXIBLE DUCTS

- A. Available Manufacturers:
 1. Flexmaster U.S.A., Inc.
 2. Hart & Cooley, Inc.
 3. McGill AirFlow Corporation.
- B. Insulated-Duct Connectors: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor barrier film.
 1. Pressure Rating: 10-inch w.g. positive and 1.0-inch w.g. negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 210°F.
- C. Flexible Duct Clamps: Nylon strap in sizes 3 through 18 inches to suit duct size.

2.11 ROOF AND WALL JACKS (CAPS) AND FLASHING

- A. Wall jacks, caps and dryer vents: Greenheck.
- B. Sloped roof: as manufactured by Greenheck, Low Pressure Roof Cap with integral backdraft damper; galvanized steel G-90.
- C. Flat roof: as manufactured by Greenheck, Spun Aluminum Roof Cap with screen, no damper.
- D. Metal roof flashing: Master Flash EDPM Rubber pipe and duct flashing boot.

2.12 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.13 DUCT ADHESIVES, SEALANTS AND CAULKS

- A. Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2. Such products also shall comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene), except for aerosol products specified in subsection B, below.
- B. Aerosol adhesives, and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of California Code of Regulations, Title 17, commencing with Section 94507.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.
- C. Verify all dimensions at the site making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Check plans showing work of other trades and consult with Architect in the event of any interference.

3.2 DISCREPANCIES

- A. In the event of discrepancy, immediately notify Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.3 APPLICATION AND INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install back draft dampers on outside air intakes, exhaust fans, or exhaust ducts nearest to outside and where indicated.
- D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.
- F. Provide test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
- H. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- I. Install duct test holes where indicated and required for testing and balancing purposes.
- J. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.

3.4 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Section 15990 Testing, Adjusting, and Balancing."

3.5 DUCTWORK AND ACCESSORIES

- A. Fabricate and support in accordance with 2010 California Mechanical Code, SMACNA HVAC Duct Construction Standards Metal and Flexible, and ASHRAE handbooks, except as indicated. Gages for galvanized steel ducts for low pressure systems up to 2" w.g. shall be as follows:

RECTANGULAR DUCT		ROUND DUCT		
Dimension of Largest (L) Side, in Inches	Ga.	Diameter (D) in Inches	Long Seam Ga.	Spiral Seam Ga.
$L \leq 12$	26	$D < 8$	28	28
$12 < L \leq 30$	24	$8 < D \leq 14$	26	28
$30 < L \leq 54$	22	$14 < D \leq 16$	24	26
$54 < L \leq 84$	20	$16 < D \leq 18$	24	24
$84 \leq L$	18	$18 < D \leq 26$	22	24
		$26 < D \leq 36$	20	22
		$36 < D \leq 50$	20	20
		$50 < D \leq 60$	18	18

		60<D<84	16	18
Note: Exposed spiral ductwork shall be one (1) gauge heavier				

- B. Verify all dimensions at the site making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Lined ducts shall be fabricated so that new dimensions to inside of lining shall equal the sizes shown on drawings.
- C. Make allowances for beams, pipes or other obstructions in building construction and for work of other trades. Check plans showing work of other trades and consult with Architect in the event of any interference.
- D. Fittings: Manufactured fittings for all exposed ductwork. Use slop fit couplings for all pipe joints. All fittings are to be continuously welded. Where the zinc coating has been burned during fabrication, the fittings are to be painted by the manufacturer.
- E. Low Pressure Ductwork: Sheet metal gauges, transverse joint type and spacing, reinforcing type and spacing, In accordance with latest ASHRAE and SMACNA Schedules for low-pressure ductwork. Figures below are from the SMACNA Manual
- F. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- G. Elbows shall be standard radius or square with vanes as shown on Fig 2-2, 3, 4, 5, 6, & 7. Single vanes with ¾" trailing edge are preferred. Adjust the vanes so that the railing edges are parallel with the downstream duct when entering and leaving duct sizes are not equal. Turning vanes used in acoustically lined duct shall use an acoustical noise reduction turning vane.
- H. Offsets and Taper: Fig 2-9 & 10; Branch Connections: Fig 2-7 & 8 or as indicated on the plans.
- I. Round tees and laterals - Fig 3-4 & 5 except straight tees are not acceptable.
- J. Junctions between ducts: Branch take-off with 45° or 90° tapered spin-in. No branch duct to intersect main duct on bottom.
- K. Seal all longitudinal and transverse duct and plenum joints and field formed seams airtight (Seal Class B) with medium water based, low VOC, pressure duct sealant.
- L. Joints between ducts: Make with beaded sleeve joints. Apply duct sealer to male end. Mechanically fasten with sheet metal screws or pop rivets. Over joint and screw or rivet heads, apply coating of duct sealer. Cover entire joint with duct tape.
- M. Supports for ducts and plenums shall be band iron supports according to Section IV.
- N. All ductwork shall be concealed behind finished wall, ceilings or floors unless specifically noted "exposed" on the drawings. Ductwork shown to be exposed shall be installed to provide maximum headroom and/or floor space.
- O. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- P. Access Panels and Doors in Ductwork: Provide in ductwork as indicated and wherever necessary or required for proper access to all instruments, controls, fire and automatic

dampers and equipment and for convenient inspection and maintenance. Size as approved by Architect.

- Q. Install ductwork of sizes, runs and connections as shown on drawings.
- R. Fabricate ductwork in workman-like manner with airtight joints; presenting smooth surfaces on inside, neatly finished on outside; construct with curves, bends; turning vanes to aid in easy flow of air. Make internal ends of slip joints in directions of air flow.
- S. Install ductwork to provide maximum headroom.
- T. Adjust ducts to suit local conditions. Alter duct sizes on basis of equal friction where required to facilitate installation.
- U. Provide ductwork connected to air-handling equipment or air inlet and outlet devices, with all necessary transformation pieces, flexible fabric connections as required. Secure fabric connectors tightly to fans, casings and ducts. Allow at least 1" slack in connections. Do not paint fabric connectors. Provide galvanized steel weather shield over exterior top and sides of exposed flexible connections.
- V. Diagonally or transversely cross break all panels on metal rectangular ducts over 18" in either direction.
- W. Avoid penetration of ducts. Provide airtight rubber grommets at unavoidable penetrations of hanger rods.
- X. Duct Openings: Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc.
- Y. Provide pitot tube openings where required for testing of systems: Complete with metal cap with spring device or screw to ensure against air leakage.
- Z. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

3.6 GREASE EXHAUST DUCTS

- A. Construct as required with Section 510 of the 2016 California Mechanical Code.
- B. Ducts shall be constructed of and supported by carbon steel not less than 0.054 inches (16 gauge) in thickness or type 316 stainless steel not less than 0.043 inches (18 gauge) in thickness.
- C. Ductwork exposed to weather or view shall be of 316 stainless steel construction, no less than 18 gauge (0.043" thick).
- D. Seams, joints, penetrations, and duct-to-hood collar connections shall have a liquid-tight continuous external weld. Exceptions to weld as per Section 510.5.2 Exceptions.
- E. Construct and install so grease cannot become pocketed in any portion. Slope duct 1/4-inch per foot down toward hood if less than 75 feet of horizontal duct run. Slope of 1" per foot when more than 75 feet of horizontal duct run. Only if slope is impossible due to structural or architectural space limitations, slope in direction of air flow to low-point drain. Provide 1-inch drain from all low points to nearest air gap waste. Drain to have S trap for water seal.
- F. Do not cross break bottom panels of duct.

- G. Securely fasten in place at every change in direction. No penetration of any duct wall.
- H. Enclose ducts penetrating a ceiling, wall or floor from the point of penetration to the outside by the general contractor.
- I. Provide access doors in duct at maximum 10 feet intervals and at each change in direction.
- J. For cleanout openings located in ducts within a fire-resistive shaft or enclosure, provide access openings in shaft or enclosure at each cleanout point. These access openings shall provide direct access to duct with work platforms provided where required.

3.7 DISHWASHER EXHAUST AND SPECIALTY PLENUMS

- A. Entire length of dishwasher exhaust and 10-feet downstream of in-line humidifiers: continuously welded stainless steel, slopes and drains as for grease duct, or aluminum continuously soldered or welded.
- B. Slope duct 1/4-inch per foot down toward equipment if less than 75 feet of horizontal duct run. 1" per foot when more than 75 feet of horizontal duct run. Only if is impossible due to structural or architectural space limitations, slope in direction of air flow to low-point drain. Provide 1-inch drain from all low points to nearest air gap waste. Drain to have S trap for water seal.
- C. Do not cross break bottom panel of duct.

3.8 DUCT HANGERS AND SUPPORTS

- A. General: Attachment to structure, as specified in Section 23 05 00, "GENERAL MECHANICAL PROVISIONS".
- B. Install hangers for ducts as specified in the SMACNA Manual.
- C. Duct Riser Supports:
 - 1. Unless otherwise specified or shown, support vertical ducts by means of two steel angles, riveted to duct and resting on floor slab or adjacent structural steel members and specified vibration isolators at every floor through which the duct passes. Size supports as follows (all dimensions in inches):

Max. Side Dimensions in Inches	Support Angle	Secure to Duct Width	Minimum Bearing Each End
36	1 x 1 x 1/8	Screws	2
48	1-1/2 x 1-1/2 x 1/8	Bolts	3
60	2 x 2 x 1/8	Bolts	3
Over 60	2-1/2 x 2-1/2 x 3/16	Bolts	4

3.9 FLEXIBLE DUCT

- A. Do not use flexible duct for duct connection through walls or gypsum board.
- B. Use insulated flex duct on run-outs to air outlets. Maximum flexible duct length duct length of 7-feet. Bends greater than 90-degrees not permitted.
- C. Flex duct on exhaust same as above but without insulation.

- D. Connect flexible ducts with liquid adhesive plus tape, draw band, or adhesive plus sheet metal screens.

3.10 DUCT CLEANING

- A. Oil film on sheet metal shall be removed prior to shipment to site. Ducts shall be inspected on site to confirm that no oil is present; remove oil if so detected. If ducts contain dust and dirt, clean the ducts immediately, prior to substantial completion and prior to using the ducts to circulate air.
- B. Clean duct system and force air at high velocity through duct to remove accumulated dust during construction. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.

END OF SECTION

03/12/19

SECTION 23 34 00

HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete, finished and workman-like installation. Work under this section includes all labor, equipment, material, services, transportation, etc. required for any reasonably incidental to the complete and satisfactory installation of all of the HVAC Systems as indicated on the Drawings or specified herein.
 - 1. Roof Exhaust Fan.
 - 2. Cabinet and Ceiling Exhaust Fan.
 - 3. Test and Balance.
 - 4. Submittals and Shop Drawings.
 - 5. Record Drawings.
 - 6. Operation and Maintenance Manuals.
 - 7. Caulking
 - 8. Guarantee

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00, GENERAL MECHANICAL PROVISIONS
- B. Section 23 33 00, DUCTWORK AND ACCESSORIES
- C. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING

1.4 WORK DONE BY OTHER DIVISIONS OR SECTIONS

- A. The following work, which is sometimes included in the Air Conditioning Section, will in this case be furnished under other Divisions or Sections. Installation will be by other Divisions or Sections unless specifically noted to be performed by this Section.
 - 1. Finish painting of air conditioning installation unless specifically mentioned or shown.
 - 2. Door louvers and exterior wall louvers.
 - 3. Electrical.

1.5 GENERAL REQUIREMENTS

- A. This section of the specification shall be considered as a part of the entire specification and all applicable portions of General Conditions, Special Conditions, and Division 1 shall apply.
- B. Erection: The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the erection of the work, together with all necessary

journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start of operate and test the work involved.

1.6 REFERENCES

- A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
- C. AMCA 300 - Test code for sound rating air-moving devices.
- D. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation System.
- E. ARI 270 - Sound rating of Outdoor Unitary Equipment.
- F. ASHRAE 52-76 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- G. SMACNA - Low Pressure Duct Construction Standards.
- H. California Mechanical Code

1.7 SUBMITTALS AND SHOP DRAWINGS

- A. Contractor agrees that shop drawings submittals processed by the Owner do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the Owner to monitor the Contractor's progress and understanding of the design. The process of review of the Contractor's submittals is not of testing the Owner's perception. If deviations, discrepancies or conflicts between shop drawings submittals and the Contract Documents are discovered either prior to or after the shop drawing submittals is processed by the Owner, the Contractor agrees that the Contract Documents shall control and shall be followed.
- B. Materials and Equipment: As soon as possible and within 35 days after award of the contract, and before their purchase, the Contractor shall submit to the Owner seven bound booklets for approval containing a complete list of materials, specialties and equipment he is to furnish for the installation. Literature shall be standard manufacturer's catalog cuts and items to be installed shall be clearly indicated. All submittals shall be made at one time.
- C. Each item shall be identified by manufacturer, brand and trade name, number, size, rating and whatever other data is necessary to properly identify and check the materials and equipment. The words: "as specified" will not be considered sufficient identification.
- D. Accessories, controls, finish, etc., not submitted or identified with the submitted equipment shall be furnished and installed as specified.
- E. Shop drawings shall be approved only to extent of information indicated. Approval of an item of equipment shall not be construed to mean approval for components for that item for which Contractor has provided no information.
- F. Approval of shop drawings shall not relieve Contractor of responsibility for providing all controls, wiring, components, etc. which are shown or specified, or all additional controls, wiring, components, etc. required to provide complete and correctly operating mechanical systems.

- G. Submit product data for the following manufactured products, assemblies, personnel and testing agencies required for this project.
 - 1. Fans.
 - 2. Controls.
 - 3. Detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guarantee.

1.8 DELIVERY, STORAGE AND PROTECTION OF PROPERTY

- A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet construction schedule, together with any special handling charges, shall be borne by the contractor.
- B. Materials shall be delivered in ample quantities from time to time as may be necessary for the uninterrupted progress of the work. They shall be stored as to cause the least obstruction to the premises and distributed so as to prevent overloading to any portion of the structure.
- C. The Contractor shall provide temporary storage and shop areas that are required at the site for the safe and proper storage of materials, tools, and other items used in the performance of this work. These areas shall be constructed only in approved locations and shall not interfere with the work of any other Contractor.
- D. All work, equipment and materials shall be protected at all times. The Contractor shall make good all damage caused either directly or indirectly by his own workmen. The Contractor shall also protect his own work from damage. He shall close all pipe and duct openings with caps or plugs during installation. He shall protect all of his equipment and materials against dirt, water, chemical, and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

1.9 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - 1. The warranty of this equipment is to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at the Manufacturers option when returned to Manufacturer, transportation prepaid
 - 2. Motor Warranty is warranted by the motor manufacturer for a period of one year. Should motors furnished by us prove defective during this period, they should be returned to the nearest authorized motor service station.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and equipment shall be new and of the best of their respective grades, free from all defects and of the make, brand or quality herein specified or as accepted by the Owner.
- B. All materials and equipment shall be identified by manufacturer's name or nameplate data. Unidentified material or equipment shall be removed from the site.

- C. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in the catalog as standard with the equipment. Optional or additional accessories shall be furnished as specified.
- D. Where no specific make of material or equipment is mentioned, any first class product of a reputable manufacturer may be used, provided it conforms to the requirements of the system and meets with the approval of the Owner.
- E. Equipment and materials damaged during transportation, installation and operation shall be considered as "totally damaged" and shall be replaced with new. Any variance from this clause shall be made only with written approval of the Owner.

2.2 DIRECT DRIVE ROOF UPBLAST CENTRIFUGAL EXHAUST FAN

- A. Manufacturer: Greenheck model CUE or equal
- B. General Description:
 - 1. Discharge air directly away from the mounting surface
 - 2. Roof mounted applications
 - 3. Maximum continuous operating temperature is 400 Fahrenheit
 - 4. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.
- C. Wheel:
 - 1. Material type: non-stick coating
 - 2. Non-overloading, backward inclined centrifugal
 - 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 - 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.
- D. Motor:
 - 1. Motor enclosures: Open dripproof
 - 2. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and furnished at the specific voltage and phase
 - 3. Mounted on vibration isolators, out of the airstream
 - 4. For motor cooling there shall be fresh air drawn into the motor compartment through an area free of discharge contaminants
 - 5. Accessible for maintenance
- E. Housing:
 - 1. Constructed of heavy gauge aluminum includes exterior housing, curb cap, windband, and motor compartment housing. Galvanized material is not acceptable.
 - 2. Housing shall have a rigid internal support structure.
 - 3. Windband to be one piece uniquely spun aluminum construction and maintain original material thickness throughout the housing.
 - 4. Windband to include an integral rolled bead for strength.
 - 5. Curb cap base to be fully welded to windband to ensure a leak proof construction. Tack welding, bolting, and caulking are not acceptable.
 - 6. Curb cap to have integral deep spun inlet venturi and pre-punched mounting holes to ensure correct attachment to curb.
 - 7. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.
 - 8. Breather tube shall be 10 square inches in size for fresh air motor cooling, and designed to allow wiring to be run through it.
- F. Motor Cover:
 - 1. Constructed of aluminum

- G. Vibration Isolation:
 - 1. Double studded true isolators
 - 2. No metal to metal contact
 - 3. Sized to match the weight of each fan
- H. Disconnect Switches:
 - 1. NEMA rated: 3R
 - 2. Positive electrical shut-off
 - 3. Wired from fan motor to junction box installed within motor compartment
- I. Drain Trough:
 - 1. Allows for one-point drainage of water, grease, and other residues
- J. Options/Accessories:
 - 1. Birdscreen:
 - 2. Construction of galvanized steel
 - 3. Protects fan discharge
 - 4. Clean Out Port:
 - a. Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
 - 5. Grease Trap:
 - a. Constructed of aluminum
 - b. Includes drain connection
 - c. Collects grease residue

2.3 ROOF EXHAUST FAN:

- A. Centrifugal Fan Unit: Direct driven with AMCA seal. Impellers shall be backward inclined non-overloading, all spun aluminum construction including hubs and shall be dynamically and statically balanced. Fans shipped fully assembled and tested for amperage draw, RPM, and noise before leaving factory. Motors shall be isolated from the curb with neoprene type vibration isolation.
- B. Manufacturer: Penn, Acme, Cook, Greenheck, or equal.
- C. Back-draft damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.
- D. 1/2" mesh, 16 gage aluminum bird screens.
- E. Roof curb: minimum 12" high on any one side measured from finished roof curb bottom, self-flashing with continuously welded seams, built-in cant strip, insulation and curb bottom, interior sound baffle with acoustic insulation, curb bottom, and factory installed nailer strip.
- F. Disconnect switch: Factory wired, non-fusible, in housing for thermal overload protected motor, wall mounted type.
- G. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4 CABINET AND CEILING EXHAUST FANS

- A. General: Fans shall have acoustically insulated galvanized steel housings and shall not exceed sound level rating shown. Fans shall bear the AMCA Certified Ratings Seal and UL label. Integral back-draft damper, chatter proof mounted on discharge. Fans shall have

true centrifugal wheel or wheels. Face grille shall be of aerodynamic white plastic or aluminum design and provide 85% free area.

- B. Fans shall be provided with cord, plug and receptacle inside the housing. Entire fan, motor and wheel assembly shall be removable. Fans shall be V-belt or direct driven and motor speed shall not exceed RPM of specified models. Fan motors shall be suitably grounded and mounted on vibration isolators.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor, wall mounted type.

2.5 SCREENS

- A. Provide removable bird screens on all outside air intakes and exhaust air discharges to outside air. Screen shall be secured in frames of same materials as duct, hood or equivalent to which attached.
- B. Screens for louvers provided under other Divisions of the specifications are not included under this section.

2.6 CONTROLS

- A. The Mechanical Contractor shall be responsible for the proper coordination of all control work and electrical work in connection therewith. Contractor shall also be responsible for the proper operation of the entire system.
- B. The Electrical Contractor shall furnish and install all line voltage control wiring, and all conduit. Wire sizing and length of run shall be coordinated with the manufacturer and Electrical Engineer.
- C. Electrical Work: All electric relays, hand-off automatic switches and all electrical wiring and all conduit will be provided under the Electrical Section, except as otherwise specified. Furnish and install additional conduit, wiring, relays, and hand-off-automatic switches made necessary by the use of approved substituted equipment under this Section with no additional cost to the Owner.
- D. Refer to drawings for control diagrams and additional requirements.
- E. Where stand-alone controls are indicated, mechanical contractor shall be responsible for low voltage controls conduit, wiring, and thermostat.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the Owner, if suitability is doubted. Contractor shall notify the Owner before installation into any apparent improper locations of interference with other work such as electrical outlets, windows, cabinetwork or other features.

3.2 INSPECTION

- A. Roof-top equipment: Install in accordance with manufacturer's instructions. Mount units on factory built roof-mounting frame providing watertight enclosure to protect ductwork and utility services, or on platforms. Install roof mounting frame level.
- B. All equipment shall be installed meeting strict conformance with manufacturer's recommendations. All equipment shall be installed level and plumb. Fan and motors shall be anchored-bolted to a concrete pad or suspended or wall mounted as shown on Contract Drawings. Only cast in place anchors shall be used for fan installation. Fans will be grounded as recommended by the manufacturer.
- C. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

3.3 INSTALLATION OF EQUIPMENT

- A. Install all equipment in the locations indicated on the approved shop drawings.
- B. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- C. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly and that all adjustments have been made.
- D. All mechanical equipment (fans, ductwork, piping, etc.) shall be isolated from the building structure by means of noise and vibration isolators. No rigid contact shall be allowed between pipes or ducts and building structures or support frames.
- E. The gaps between penetrating elements, ductwork, piping and the walls of the holes shall be filled on all sides with resilient material and sealed air tight on each wall with non-hardening sealant. Provide sheet metal and collar at all exposed ductwork penetrations. Duct collar shall cover the annular space around the duct with a minimum 1" overlap.
- F. Fabricate, with steel, special mounting brackets as required to clear other equipment, doors and to span for best structural support of mechanical.
- G. All duct connections to mechanical equipment shall be made with flexible connectors.
- H. Install equipment so that nameplates are easily visible.
- I. Where not otherwise indicated, equipment and material installation is published manufactures' recommendations. This requirement includes details, clearances and accessories.

3.4 INSTALLATION OF CEILING CIRCULATION FAN

- A. Fan location must have a typical bar joist or existing I-beam structure from which to mount the fan. Additional mounting options may be available.
- B. Mounting structure must be able to support weight and operational torque of fan. Consult structural engineer if necessary.
- C. Fan location must be free from obstacles such as lights, cables, or other building components.

- D. Check fan location for proper electrical requirements. Consult Installation Guide for appropriate circuit requirements.
- E. Each fan requires dedicated branch circuit protection.
- F. The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle irons for bar joist applications. Big Ass Fans recommends consulting a structural engineer for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.
- G. Minimum Distances
 - 1. Airfoils must be at least 10 ft (3 m) above the floor.
 - 2. Installation area must be free of obstructions such as lights, cables, sprinklers, or other building structures with the airfoils at least 2 ft (0.61 m) clear of all obstructions.
 - 3. The structure the fan is attached to shall be capable of supporting a torque load of up to 40 ft·lb (54 N·m) of torque.
- H. The fan shall not be located where it shall be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters. Additional details are in the Big Ass Fans 3.2 Installation Manual.
- I. The fan is suitable for use in wet locations when installed on a GFCI protected branch circuit.
- J. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
 - 1. The maximum fan diameter shall be 24 ft (7.3 m).
 - 2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
 - 3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
- K. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72—National Fire Alarm and Signaling Code.

3.5 CUTTING, PATCHING AND DAMAGE

- A. All necessary cutting and patching of walls, floors, partitions, ceilings, etc., as required for the proper installation of work under this section shall be done under this section. No cutting of structural members will be permitted without the written permission of the Architect.
- B. Any existing work or equipment damaged during the progress of construction or testing shall be replaced with like material, free of charge to the Owner or other trades.

3.6 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.7 AIR BALANCING

- A. Refer to Section 23 05 93.

3.8 CLEANING

- A. Completely cover motor and other moving machinery to protect from dirt and water during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.
- B. During the process of work, premises shall be kept reasonably free of all debris, cuttings and waste material resulting from work under this heading. All debris, rubbish, leftover material tools and equipment shall be removed from the site prior to final acceptance.
- C. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.
- D. Damaged factory applied finished shall be "touched up". "Touched up" shall be accomplished with preparation, prime and finish coats applied in strict accordance with manufactures recommendations.

3.9 EQUIPMENT IDENTIFICATION AND OPERATION INSTRUCTIONS

- A. Furnish the Owner with a hard bound brochure titled "Mechanical System" which shall contain the following information typed, indexed, tabbed and bound inside:
 - 1. An alphabetical list of all equipment excepting pipe and fittings: the manufacture; the catalog number; and the local distributing agent, including his address and telephone number.
 - 2. Manufacturer's instructions for all items requiring maintenance. This shall include, but not be limited to, all motor driven equipment, controls, pressure regulating devices, packaged equipment, etc. Where manufacturer's directions are not clear, are incomplete or do not exist, develop information necessary to service, clean, adjust, etc., all items. Delete all information in manufacturer's literature, which is not applicable. Identify all equipment in the manual. List the time intervals that all maintenance tasks should be performed.
 - 3. Submit three (3) copies of the brochure to the Architect for approval and furnish the Owner with at least two (2) corrected brochures.
 - 4. Provide for and fasten to each piece of equipment a permanent name plate fabricated of engraved laminated plastic, white between black laminations, indicating the identifying mark and the area or spaces served by the equipment.

END OF SECTION

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SECTION 23 37 13

AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.
- B. Coordinate with Architect location of air outlets and inlets.

1.2 DESCRIPTION OF WORK

- A. Supply and return air grille

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00, GENERAL MECHANICAL PROVISIONS
- B. Section 23 33 00, DUCTWORK AND ACCESSORIES
- C. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING

1.4 QUALITY ASSURANCE

- A. Refer to article, QUALITY ASSURANCE, in Section 23 05 00.
- B. Fire Safety Code: Comply with NFPA 90A.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Diffusers, registers, grilles and accessories.
- C. Coordination Drawings: Refer to article, SUBMITTALS, in Section 23 05 00.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air Diffusion Council Test Code:
 - 1. 1062 GRD-84 Certification, Rating, and Test Manual 4th Edition
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE7-98 Minimum Design Loads for Buildings and Other Structures

- D. American Society for Testing and Materials (ASTM):
 - 1. A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - 2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process
 - 3. A1011 - Standard Specification for Steel Sheet and Strip Hot rolled Carbon structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
 - 4. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 5. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- E. National Fire Protection Association (NFPA):
 - 1. 90A-99 Standard for the Installation of Air Conditioning and Ventilating Systems
 - 2. 96-01 Ventilation Control and Fire Protection of Commercial Cooking Operations
- F. Underwriters Laboratories, Inc. (UL):
 - 1. 33-93 UL Standard for Safety Heat Responsive Links for Fire Protection Service

PART 2 - PRODUCTS

2.1 AIR OUTLETS AND INLETS

- A. Materials:
 - 1. Aluminum. Provide manufacturer's standard gasket.
 - 2. Exposed Fastenings: The same material as the respective inlet.
 - 3. Contractor shall review all ceiling and wall drawings and details and provide all ceiling and wall mounted devices with appropriate dimensions and trim for the specific locations.
- B. Performance Test Data: In accordance with Air Diffusion Council Code 1062GRD.
- C. Air Supply Outlets:
 - 1. Ceiling Diffusers: Temperature control diffuser suitable for surface mounting and lay-in ceiling mount, off-white finish, and square connection as shown on the drawings. Provide plaster frame for units in plaster ceilings.
 - a. Face type: Square, 4-way directional pattern.
 - b. Control: Wired digital wall adjuster.
 - 2.
 - 3. Wall Grille: Reversible core, Narrow blade grilles with option of a 15 degree or 5 degree blade deflection.
 - a. Flush mount
 - b. Finish: #26 White
 - c. Supply and return
- D. Return or Exhaust Diffuser: Provide opposed blade damper without removable key operator for diffuser.
 - 1. Finish: Off-white baked enamel for ceiling mounted units.
 - 2. Perforated Face Type.
 - 3. Lay-in ceiling
- E. Exhaust Register: Aluminum border and grid with 1/2"x1/2"x1/2" core size.
 - 1. Finish:
 - 2. Egg Crate face type.
 - 3. Flush mount.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with provisions of Section 23 05 00, particularly regarding coordination with other trades and work in existing buildings.
- B. Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair or replacement. Protect equipment during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting.

3.2 CUTTING, PATCHING AND DAMAGE

- A. All necessary cutting and patching of walls, partitions, ceilings, etc., as required for the proper installation of work under this section shall be done under this section. No cutting of structural members will be permitted without the written permission of the Architect.
- B. Any existing work or equipment damaged during the progress of construction or testing shall be replaced with like material, free of charge to the School District or other trades.

3.3 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.4 AIR OUTLETS

- A. Install inclined blade return and exhaust grilles and registers so that blades obstruct vision by inclining blades as follows:
 - 1. Wall Outlets near Ceiling: Incline toward ceiling.

3.5 AIR BALANCING

- A. Refer to Section 23 05 93.

END OF SECTION

08/27/18

SECTION 23 74 33

KITCHEN MAKE-UP AIR UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This section includes Packaged Make-Up Air Units with integral Indirect Gas-Fired heating with cooling for outdoor installation. Integral cooling source shall be Evaporative Cooling. Airflow arrangement shall be Outdoor Air only. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in PART 2 of this specification.

1.3 SUBMITTALS

- A. Product Data: For each type or model, include the following:
 - 1. Complete fan performance curves for Supply Air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
 - 2. Sound performance data for Supply Air, as tested in an AMCA Certified chamber.
 - 3. Motor ratings, electrical characteristics and motor and fan accessories.
 - 4. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
 - 5. Estimated gross weight of each installed unit.
 - 6. Installation, Operating and Maintenance manual (IOM) for each model.
 - 7. Remote Panel description to include all functions.

1.4 CLOSEOUT SUBMITTALS

- A. Equipment Identification and Operation Instructions: Furnish the Owner with a hard bound brochure titled "Mechanical System" which shall contain the following information typed, indexed, tabbed and bound inside:
 - 1. An alphabetical list of all equipment excepting pipe and fittings: the manufacture; the catalog number; and the local distributing agent, including his address and telephone number.
 - 2. Manufacturer's instructions for all items requiring maintenance. This shall include, but not be limited to, all motor driven equipment, controls, pressure regulating devices, packaged equipment, etc. Where manufacturer's directions are not clear, are incomplete or do not exist, develop information necessary to service, clean, adjust, etc., all items. Delete all information in manufacturer's literature, which is not applicable. Identify all equipment in the manual. List the time intervals that all maintenance tasks should be performed.
 - 3. Submit three (3) copies of the brochure to the Architect for approval and furnish the Owner with at least two (2) corrected brochures.
 - 4. Provide for and fasten to each piece of equipment a permanent name plate fabricated of engraved laminated plastic, white between black laminations, indicating the identifying mark and the area or spaces served by the equipment.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain Packaged Make-Up Air Unit with Integral Heating and Cooling with all appurtenant components or accessories from a single manufacturer.
- B. Product Options: Drawings must indicate size, profiles and dimensional requirements of Make-Up Air Units and are to be based on the specific system indicated. Section 01 60 00, "Materials and Equipment".
- C. Certifications:
 - 1. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL mark.
 - 2. Indirect gas-fired heaters shall be ETL certified as a component of the unit.

1.6 COORDINATION

- A. Coordinate size and location of all building penetrations required for installation of each Make-Up Air Unit and associated ducting, plumbing and electrical systems.
- B. Coordinate sequencing of construction of associated plumbing, HVAC, and electrical supply.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
 - 1. Greenheck Fan Corporation.

2.2 MANUFACTURED UNITS

- A. Unit with Integral Indirect gas-fired Heating and Evaporative Cooling shall be fully assembled at the factory and consist of curb assembly, motorized intake damper, evaporative cooling module, condensate drain pan, P trap, sensors, supply air blower assembly, and electrical control unit with all specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

2.3 CABINET

- A. Materials: Formed, single wall metal cabinet, fabricated to permit access to internal components for maintenance.
 - 1. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvanized steel. Base rail is 12 gauge, galvanized (G90) steel.
 - 2. Internal Assemblies: 24 gauge galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
- B. Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
 - 1. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
 - a. Thickness: 1 inch (25 mm)

- b. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
 - c. Location and application: Floor of each unit shall be insulated with either one half inch thick or 1 inch thick rigid fiberglass insulation, covered on one surface with integral aluminum foil.
- C. Access panels: Unit shall be equipped with removable access panels to provide easy access to all major components. Access panels shall be fabricated of 18 gauge steel. Removable access panels shall incorporate a formed drip edge.
- D. Supply Air blower assembly: Blower assembly consists of an electric motor and a belt driven, double width, double inlet forward curve blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on spring isolation devices.
- E. Control panel / connections: Unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.
- F. Indirect Gas-Fired Furnace:
 - 1. Shall be ETL Certified as a component of the unit.
 - 2. Shall have an integral combustion gas blower.
 - 3. Shall be ETL Certified for installation downstream of a cooling coil.
 - 4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
 - 5. Shall have 4-pass tubular heat exchangers, constructed of aluminized steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.
 - 6. Heat exchanger shall have a one year warranty.
 - 7. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off or hinged door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly and exhaust blower.
 - 8. Shall include a kit for Outdoor mounting with Standard venting.
- G. Condensate drain pan: Drain Pan shall be an integral part of the MAU whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
- H. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.
- I. Evaporative Cooling Module: Media holder and sump pan shall be fabricated of stainless steel and shall use CELdek media. Gutter and sump shall be sized to supply the system with enough water to operate at its maximum flow rate and not overflow when the system is shut down. Cooling module shall be equipped with circulating pump.
- J. Dampers: Motorized Intake Air dampers of low leakage type shall be factory installed.
- K. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E.
- L. Curb Assembly: A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapters for supply air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the

bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly.

2.4 BLOWER

- A. Blower section construction, Supply Air: Belt drive motor and blower shall be assembled onto a minimum 14 gauge galvanized steel platform and must have helical coil spring vibration devices.
- B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
- C. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.
- D. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.
- E. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5 MOTORS

- A. General: Blower motors greater than .75 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPA's minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined cast-type, keyed and fully secured to the fan wheel and motor shafts. Electric motors of ten horsepower or less shall be supplied with an adjustable drive pulley. Comply with requirements in Division 23 05 13, matched with fan load.
- B. Motors shall be 60 cycle, 3 phase, 208 volt.

2.6 UNIT CONTROLS

- A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS).
- B. Remote Panel: Manufacturer shall provide and contractor shall install a Commercial Kitchen type remote panel that functions as a remote indicator of owner-selected operating parameters.
- C. Sensors to be provided with the unit include:
 - 1. Heating Inlet Air Sensor
 - 2. 120V/24V Smoke Detector

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the Owner, if suitability is doubted. Contractor shall notify the Owner before installation into any apparent improper locations of interference with other work such as electrical outlets, windows, cabinetwork or other features.

3.2 INSPECTION

- A. Roof-top equipment: Install in accordance with manufacturer's instructions. Mount units on factory built roof-mounting frame providing watertight enclosure to protect ductwork and utility services, or on platforms. Install roof mounting frame level.
- B. All equipment shall be installed meeting strict conformance with manufacturer's recommendations. All equipment shall be installed level and plumb. Fan and motors shall be anchored-bolted to a concrete pad or suspended or wall mounted as shown on Contract Drawings. Only cast in place anchors shall be used for fan installation. Fans will be grounded as recommended by the manufacturer.
- C. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

3.3 INSTALLATION OF EQUIPMENT

- A. Install all equipment in the locations indicated on the approved shop drawings.
- B. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- C. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly and that all adjustments have been made.
- D. All mechanical equipment (fans, ductwork, piping, etc.) shall be isolated from the building structure by means of noise and vibration isolators. No rigid contact shall be allowed between pipes or ducts and building structures or support frames.
- E. The gaps between penetrating elements, ductwork, piping and the walls of the holes shall be filled on all sides with resilient material and sealed air tight on each wall with non-hardening sealant. Provide sheet metal and collar at all exposed ductwork penetrations. Duct collar shall cover the annular space around the duct with a minimum 1" overlap.
- F. Fabricate, with steel, special mounting brackets as required to clear other equipment, doors and to span for best structural support of mechanical.
- G. All duct connections to mechanical equipment shall be made with flexible connectors.
- H. Install equipment so that nameplates are easily visible.
- I. Where not otherwise indicated, equipment and material installation is published manufactures' recommendations. This requirement includes details, clearances and accessories.

3.4 CUTTING, PATCHING AND DAMAGE

- A. All necessary cutting and patching of walls, floors, partitions, ceilings, etc., as required for the proper installation of work under this section shall be done under this section. No cutting of structural members will be permitted without the written permission of the Architect.
- B. Any existing work or equipment damaged during the progress of construction or testing shall be replaced with like material, free of charge to the Owner or other trades.

3.5 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.6 FILTERS

- A. Do not operate air supply system unless filters are installed, including temporary pre-filters for use during construction. If not used, deliver the spare set to the Owner at the time of acceptance.
- B. Install new filters at final inspection concurrently with turn over to Owner.

3.7 SOUND AND VIBRATION ISOLATION

- A. All vibrating equipment shall be sound isolated from the structure.
- B. The Contractor shall submit all necessary data for each vibration isolator, including static deflection and weight loading, for equipment in operation.
- C. All vibrating equipment shall be provided with flexible pipe connections. Submit for approval prior to installation.

3.8 CLEANING

- A. Completely cover motor and other moving machinery to protect from dirt and water during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.
- B. During the process of work, premises shall be kept reasonably free of all debris, cuttings and waste material resulting from work under this heading. All debris, rubbish, leftover material tools and equipment shall be removed from the site prior to final acceptance.
- C. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.
- D. Damaged factory applied finished shall be "touched up". "Touched up" shall be accomplished with preparation, prime and finish coats applied in strict accordance with manufactures recommendations.

END OF SECTION

08/27/18

SECTION 23 81 00

VARIABLE REFRIGERANT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Section, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete, finished and workman-like installation. Work under this section includes all labor, equipment, material, services, transportation, etc. required for any reasonably incidental to the complete and satisfactory installation of all of the HVAC Systems as indicated on the Drawings or specified herein.
 - 1. Variable Refrigerant Outdoor Units
 - 2. Variable Refrigerant Fan Coils
 - 3. Test and Balance.
 - 4. Submittals and Shop Drawings.
 - 5. Record Drawings.
 - 6. Operation and Maintenance Manuals.
 - 7. Vibration isolation supports and hangers.
 - 8. Seismic restraining devices.
 - 9. Caulking
 - 10. Guarantee

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00, GENERAL MECHANICAL PROVISIONS
- B. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING
- C. Section 23 07 00, MECHANICAL INSULATION
- D. Section 23 09 00, HVAC INSTRUMENTATION AND CONTROLS
- E. Section 23 31 00, DUCTWORK AND ACCESSORIES

1.4 WORK DONE BY OTHER DIVISIONS OR SECTIONS

- A. The following work, which is sometimes included in the Air Conditioning Section, will in this case be furnished under other Divisions or Sections. Installation will be by other Divisions or Sections unless specifically noted to be performed by this Section.
 - 1. Finish painting of air conditioning installation unless specifically mentioned or shown.
 - 2. Electrical.

1.5 GENERAL REQUIREMENTS

- A. This section of the specification shall be considered as a part of the entire specification and all applicable portions of General Conditions, Special Conditions, and Division 1 shall apply.
- B. Erection: The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the erection of the work, together with all necessary journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start of operate and test the work involved.

1.6 REFERENCES

- A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
- C. AMCA 300 - Test code for sound rating air-moving devices.
- D. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation System.
- E. ARI 270 - Sound rating of Outdoor Unitary Equipment.
- F. ASHRAE 52-76 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- G. SMACNA - Low Pressure Duct Construction Standards.
- H. California Mechanical Code - 2016 Edition.

1.7 COORDINATION

- A. Following the general arrangement indicated on the Drawings as closely as possible, the Contractor shall coordinate with the architectural, structural, plumbing, electrical and all other trades prior to installation of the materials and equipment to verify adequate space available for installation of the work shown. The District shall be immediately notified if an area of conflict occurs between trades.
- B. The Contractor shall bear all costs incurred for work that must be relocated due to conflicts between trades.
- C. The Mechanical Contractor shall coordinate all requirements for all points of connection with the General Contractor and other trades prior to bid.

1.8 SUBMITTALS AND SHOP DRAWINGS

- A. Contractor agrees that shop drawings submittals processed by the District do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the District to monitor the Contractor's progress and understanding of the design. The process of review of the Contractor's submittals is not of testing the District's perception. If deviations, discrepancies or conflicts between shop drawings submittals and the Contract Documents are discovered either prior to or after the shop drawing submittals is processed by the District, the Contractor agrees that the Contract Documents shall control and shall be followed.

- B. Materials and Equipment: As soon as possible and within 35 days after award of the contract, and before their purchase, the Contractor shall submit to the District seven bound booklets for approval containing a complete list of materials, specialties and equipment he is to furnish for the installation. Literature shall be standard manufacturer's catalog cuts and items to be installed shall be clearly indicated. All submittals shall be made at one time.
- C. Each item shall be identified by manufacturer, brand and trade name, number, size, rating and whatever other data is necessary to properly identify and check the materials and equipment. The words: "as specified" will not be considered sufficient identification.
- D. Accessories, controls, finish, etc., not submitted or identified with the submitted equipment shall be furnished and installed as specified.
- E. Shop drawings shall be approved only to extent of information indicated. Approval of an item of equipment shall not be construed to mean approval for components for that item for which Contractor has provided no information.
- F. Approval of shop drawings shall not relieve Contractor of responsibility for providing all controls, wiring, components, etc. which are shown or specified, or all additional controls, wiring, components, etc. required to provide complete and correctly operating mechanical systems.
- G. Submit product data for the following manufactured products, assemblies, personnel and testing agencies required for this project.
 - 1. Variable Refrigerant Outdoor Units
 - 2. Variable Refrigerant Fan Coils
 - 3. Controls.

1.9 CLOSEOUT SUBMITTALS

- A. Equipment Identification and Operation Instructions: Furnish the Owner with a hard-bound brochure titled "Mechanical System" which shall contain the following information typed, indexed, tabbed and bound inside:
 - 1. An alphabetical list of all equipment excepting pipe and fittings: the manufacture; the catalog number; and the local distributing agent, including his address and telephone number.
 - 2. Manufacturer's instructions for all items requiring maintenance. This shall include, but not be limited to, all motor driven equipment, controls, pressure regulating devices, packaged equipment, etc. Where manufacturer's directions are not clear, are incomplete or do not exist, develop information necessary to service, clean, adjust, etc., all items. Delete all information in manufacturer's literature, which is not applicable. Identify all equipment in the manual. List the time intervals that all maintenance tasks should be performed.
 - 3. Submit three (3) copies of the brochure to the Architect for approval and furnish the Owner with at least two (2) corrected brochures.
 - 4. Provide for and fasten to each piece of equipment a permanent name plate fabricated of engraved laminated plastic, white between black laminations, indicating the identifying mark and the area or spaces served by the equipment.

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit two sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, binders with durable plastic covers. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", and title of project. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

- B. Contents: Prepare a Table of Contents with each Product or system description identified.
 - 1. Part 1: Directory listing names, addresses, and telephone numbers of District, Contractor, Sub-contractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
- C. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with District comments. Revise content of documents as required prior to final submittal.
- D. Submit final volumes (revised) within ten days after final inspection.

1.11 SUBSTITUTIONS

- A. Should the Contractor desire to substitute any material, equipment or other items for those specified, he shall submit a complete list, including detailed equipment layouts and performance characteristics within 35 calendar days after the scheduled Start of Construction. Said data shall be submitted in 7 copies, assembled in individual brochures.
- B. The entire cost of all changes of any type due to substitution for materials specified shall be borne by the Contractor at no extra cost to the District.
- C. Unsolicited and voluntary deducts, on the part of the Contractor for substituting unapproved systems and/or equipment, shall not be considered for the purpose of awarding the Contract.
- D. The contractor shall submit the amount of cost credit to the Contract in the event the proposed substitution is accepted.
- E. In all cases where substitutions are proposed after bids are received, the Contractor shall bear the cost of evaluation on the basis of 2-1/2 times technical salaries of engineering personnel involved.

1.12 AVAILABILITY OF SPECIFIED EQUIPMENT

- A. Verify prior to bidding that all specified equipment is available and can be obtained in time for installation during orderly and timely progress of the work.
- B. In the event that specified items will not be so available, notify the District prior to receipt of bids
- C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by proper investigation on the part of the Contractor, will be back-charged as necessary and shall not be borne by the District.

1.13 RECORD DRAWINGS

- A. The contractor shall arrange and pay for one set of white prints of the HVAC drawings, which he shall alter in red to show all changes made to the original layout. These drawings shall be kept current.
- B. The contractor shall deliver these completed to the District when the job is finished and accepted prior to final payment.

1.14 LOCAL CONDITIONS

- A. The Contractor and trade submitting tenders on this work shall visit and will be deemed to have visited the site to ensure that they are familiar with all conditions relating to the work. Failure to visit the site will in no way relieve the successful Contractor of the necessity of furnishing any material or performing any work that may be required to complete the work in accordance with the drawings and specifications without additional cost to the District.

1.15 RULES, REGULATIONS AND CODES

- A. All work and materials shall be in full accordance with the latest California Mechanical Code, California Plumbing Code, California Building Code and local rules and regulations, State Fire Marshal regulations, the safety orders of the Division of Industrial Safety; the National Electric Code; the standards of the National Fire Protection Association; American Gas Association; Occupation and Safety Act; American National Standards Institute; American Society of Mechanical Engineers; American Society for Testing and Materials; Installation Standards published by the International Association of Plumbing And Mechanical officials (IAPMO) and other applicable laws, codes, or regulations. Nothing in these specifications shall be construed to permit work not conforming to these codes.
- B. Electrical Work: Motors, electrical apparatus and wiring specified in this section shall conform to the National Electrical Manufacturer's Standards and the National Electric Code and bear the Underwriter's label of approval.
- C. The Contractor shall furnish, without extra charge, any additional material and labor when and where required to comply with these rules and regulations, though the work be not mentioned in these Specifications or shown on the Drawings. When these Specifications or Drawings call for or describe materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of these specifications and accompanying drawings shall take precedence.

1.16 FEES AND PERMITS

- A. The Contractor must obtain and pay all fees for permits, licenses, inspections, etc., which are required by any legally constituted authority. Coordinate exact requirements with the District prior to bid.

1.17 DRAWINGS

- A. The work shall be installed as indicated on Drawings, however, changes to accommodate installation of this work with other work, or in order to meet Architectural or structural conditions, shall be made without additional cost to the District.
- B. For the purpose of clarity and legibility, the Drawings are essentially diagrammatic to the extent that many offsets, bends, unions, special fittings and exact locations are not indicated. The Contractor shall make use of all data in all of the Contract Documents, and shall verify this information at the site.

1.18 INSPECTION

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.19 DELIVERY, STORAGE AND PROTECTION OF PROPERTY

- A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet construction schedule, together with any special handling charges, shall be borne by the contractor.
- B. Materials shall be delivered in ample quantities from time to time as may be necessary for the uninterrupted progress of the work. They shall be stored as to cause the least obstruction to the premises and distributed so as to prevent overloading to any portion of the structure.
- C. The Contractor shall provide temporary storage and shop areas that are required at the site for the safe and proper storage of materials, tools, and other items used in the performance of this work. These areas shall be constructed only in approved locations and shall not interfere with the work of any other Contractor.
- D. All work, equipment and materials shall be protected at all times. The Contractor shall make good all damage caused either directly or indirectly by his own workmen. The Contractor shall also protect his own work from damage. He shall close all pipe and duct openings with caps or plugs during installation. He shall protect all of his equipment and materials against dirt, water, chemical, and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

1.20 DAMAGE BY LEAKS

- A. Refer to Section 23 05 00.

1.21 ACCESS TO EQUIPMENT FOR MAINTENANCE

- A. Install all equipment, piping, etc. to permit access for normal maintenance. Maintain easy access to filters, motors, etc. Install all such equipment and accessories to facilitate maintenance. Perform any relocation of pipes, etc. required to permit access at request of District at no additional cost to District.
- B. Furnish and install access doors or panels in walls, floors, and ceilings to permit access to equipment, dampers, and all other items requiring service. Coordinate location of access doors with other trades as required.
- C. Size access panels to allow inspection and removal of all items served.
- D. Refer to Section 23 05 00.

1.22 GUARANTEES

- A. The Contractor, in accepting this contract, binds himself to replace or repair at his own expense any defect in workmanship or material which may appear within a period of two (2) years from the date of the final acceptance of the building, and to pay for all resulting damage which shall appear within the said period; provided always that the Contractor shall not be liable for anything attributable to acts of the agents of the District, or for ordinary wear. Also, given date of work performed by the Contractor be accepted as complete, he shall agree to correct any deficiencies or omissions in respect to the plans or specifications which may appear in the afore-mentioned twenty-four month period.
- B. The Contractor guarantees that all piping as provided in this specification will be free from all obstructions, and that all piping will be tight and drip free.
- C. All refrigerant compressors shall carry a five-year manufacturer's warranty.
- D. Daikin North America LLC warrants original owner of the non-residential building, multifamily residence or residence in which the Daikin products are installed that under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material and workmanship. This warranty applies to compressor and all parts and is limited in duration to ten (10) years starting from the "installation date" which is one of the two dates below
 1. The installation date is the date that the unit is originally commissioned, but no later than 18 months after the manufacture date noted on the unit's rating plate.
 2. If the date the unit is originally commissioned cannot be verified, the installation date is three months after the manufacture date.
- E. Complete warranty details available from your local Daikin representative or at www.daikincomfort.com

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The variable capacity, heat recovery air conditioning system shall be a Daikin Variable Refrigerant Volume Series (heat and cool model) split system as specified. The system shall consist of multiple evaporators, branch selector boxes, REFNET™ joints and headers, a three-pipe refrigeration distribution system using PID control and Daikin VRV® condenser unit. The condenser shall be a direct expansion (DX), air-cooled heat recovery, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit may connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control. A dedicated hot gas pipe shall be required to ensure optimum heating operation performance. Two-pipe, heat recovery systems utilizing a lower temperature mixed liquid/gas refrigerant to perform heat recovery are not acceptable due to reduced heating capabilities.
- B. The variable capacity, heat pump air conditioning system shall be a Daikin Variable Refrigerant Volume Series (heat or cool model) system as specified. The system shall consist of multiple evaporators using PID control, REFNET™ joints and headers, a two-pipe refrigeration distribution system and Daikin VRV® condenser unit. The condenser shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit may connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control.

- C. The Daikin condensing unit shall be interconnected to indoor unit models FXFQ and FXMQ and shall range in capacity from 7,500 Btu/h to 96,000 Btu/h in accordance with Daikin's engineering data book detailing each available indoor unit. The indoor units shall be connected to the condensing unit utilizing Daikin's REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable for a variable refrigerant system.
- D. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously or all of the indoor units associated with each branch of the cool/heat selector box (BSQ_T / BS_Q54T). Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.
- E. Branch selector boxes shall be located as shown on the drawing. The branch selector boxes shall have the capacity to control up to 290 MBH (cooling) downstream of the branch selector box. Each branch of the branch selector box shall consist of three electronic expansion valves, refrigerant control piping and electronics to facilitate communications between the box and main processor and between the box and indoor units. The branch selector box shall control the operational mode of the subordinate indoor units. The use of three EEV's ensures continuous heating during defrost (multiple condenser systems), no heating impact during changeover and reduced sound levels. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
- F. The REYQ_T condensing unit model numbers and the associated number of connectable indoor units per REYQ_T condensing unit is indicated in the following table. Each indoor unit or group of indoor units shall be independently controlled.

Model Number	Nominal Capacity (Tons)	Number of Connectable Indoor Units
REYQ120TTJU	10	20

- G. The RXYQ condensing unit model numbers and the associated number of connectable indoor units per RXYQ condensing unit is indicated in the following table. Each indoor unit or group of indoor units shall be independently controlled.

Model Number	Nominal Capacity (Tons)	Maximum Number of Indoor Units
RXYQ192TTJU	16	33
RXYQ216TTJU	18	37

2.2 VRV IV FEATURES AND BENEFITS

- A. Voltage Platform: Heat recovery condensing units shall be available with a 208-230V/3/60 power supply.
- B. Advanced Zoning: A single system shall provide for up to 64 zones.
- C. Independent Control: Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.
- D. VFD Inverter Control and Variable Refrigerant Temperature: Each condensing unit shall use high efficiency, variable speed all "inverter" compressor(s) coupled with inverter fan

motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.

- E. Indoor units shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
- F. Configurator software: Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.
- G. Autocharging: Each system shall have a refrigerant auto-charging function.
- H. Defrost Heating: Multiple condenser VRV systems shall maintain continuous heating during defrost operation. Reverse cycle (cooling mode) defrost operation shall not be permitted due to the potential reduction in space temperature.
- I. Oil Return Heating: Multiple condenser VRV systems shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
- J. Low Ambient Cooling: Each system shall be capable of low ambient cooling operation to -4°F DB.
- K. Independent Control: Each indoor unit shall use a dedicated electronic expansion valve for independent control.
- L. Flexible Design:
 - 1. Systems shall be capable of up to 540ft (623ft equivalent) of linear piping between the condensing unit and furthest located indoor unit.
 - 2. Systems shall be capable of up to 3,280ft total "one-way" piping in the piping network.
 - 3. Systems shall have a vertical (height) separation of up to 295ft between the condensing unit and the indoor units.
 - 4. Systems shall be capable of up to 295ft from the first REFNET™ / branch point.
 - 5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit capacity.
 - 6. Systems shall be capable of 98ft vertical separation between indoor units.
 - 7. Condensing units shall be supported with a fan motor ESP up to 0.32". WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
- M. Oil Return: Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle
- N. Simple Wiring: Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring.
- O. Outside Air: Systems shall provide outside air capability.
- P. Space Saving: Each system shall have a condensing unit module footprint as small as 36-5/8" x 30-1/8".
- Q. Advanced Diagnostics: Systems shall include a self-diagnostic, auto-check function to detect a malfunction and display the type and location.

- R. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.
- S. Advanced Controls: Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
- T. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.
- U. Low Sound Levels: Each system shall use indoor and condensing units with quiet operation as low as 27 dB(A).

2.3 PERFORMANCE

- A. The VRV IV RXYQ_T system shall perform as indicated below

Model Number	System IEER* (part load - ducted)	System IEER* (part load – non-ducted)	System IEER* (part load - mixed)
REYQ120TTJU	20.70	25.40	23.05

Model Number	System SCHE* (part load - ducted)	System SCHE* (part load – non-ducted)	System SCHE* (part load - mixed)
REYQ120TTJU	25.10	27.90	26.50

Model Number	System COP@47F* (full load - ducted)	System COP@47F* (full load – non-ducted)	System COP@47F* (full load - mixed)
REYQ120TTJU	3.51	3.98	3.75

Model Number	System COP@17F* (full load - ducted)	System COP@17F* (full load – non-ducted)	System COP@17F* (full load - mixed)
REYQ120TTJU	2.32	2.54	2.43

- B. The VRV IV RXYQ_T system shall perform as indicated below.

Model Number	System COP@17F (full load - ducted)	System COP@17F (full load – non-ducted)
RXYQ192TTJU	2.40	2.27
RXYQ216TTJU	2.48	2.62

Model Number	System EER (full load - ducted)	System EER (full load – non-ducted)
RXYQ192TTJU	12.3	11.9

RXYQ216TTJU	11.7	11.6
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Model Number	System COP@47F (full load - ducted)	System COP@47F (full load – non-ducted)
RXYQ192TTJU	3.6	3.8
RXYQ216TTJU	3.65	3.83

- C. Performance Conditions:
1. Cooling: indoor temp. of 80°F DB, 67°F WB and outdoor temp. of 95°F DB.
 2. Heating: indoor temp. of 70°F DB and outdoor temp. of 47°F DB, 43°F WB.
 3. Equivalent piping length: 25ft
- D. Operating Range:
1. The operating range in cooling or cooling dominant simultaneous cooling/heating will be (-4°F) 23°F DB ~ 122°F DB.
 2. Each system as standard shall be capable of onsite reprogramming to allow low ambient cooling operation down to -4°F DB
 3. The operating range in heating or heating dominant simultaneous cooling/heating will be -13°F WB – 60°F WB.
 4. If an alternate equipment manufacturer is selected, the mechanical contractor shall provide, at their own risk and cost, all additional material and labor to meet low ambient operating condition and performance.
 5. Cooling mode indoor room temperature range will be 57°F-77°F WB.
 6. Heating mode indoor room temperature range will be 59°F-80°F DB.
- E. Refrigerant Piping:
1. The system shall be capable of refrigerant piping up to 540 actual feet or 623 equivalent feet from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280 feet of piping between the condensing and indoor units with 295 feet maximum vertical difference, without any oil traps.
 2. REFNET™ piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.
- F. Design Basis:
1. The HVAC equipment basis of design is Daikin North America. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein (see Key General Specifications Alternate Supplier Checklist). In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation.

2.4 CONDENSING UNIT – HEAT RECOVERY

- A. General: The condensing unit is designed specifically for use with VRV IV series components.
1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.
 2. High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.

3. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
4. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
5. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
6. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.
7. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
8. The unit shall incorporate an auto-charging feature. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.
9. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
10. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
11. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
12. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
13. The condensing unit shall be capable of heating operation at -13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
14. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.

Model Number	Fan Motor Output (kW) & Quantity
REYQ120TTJU	0.35 x 2

2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 24,684 CFM dependent on model specified.
4. Nominal sound pressure levels shall be as shown below.

Model Number	Sound Pressure Level dB(A)
REYQ120TTJU	61

5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps as shown below.

Operation Sound dB(A)	Night Mode Sound Pressure Level dB(A)
Step 1 max.	55
Step 2 max.	50
Step 3 max.	45

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion Ulta Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10)
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
6. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.

E. Compressor:

1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 3% to 100%.
5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation.
9. Compressor configurations:

Tonnage	Number of Compressors	Compressor Types
6	1	Inverter controlled
8	2	All inverter controlled
10	2	All inverter controlled
12	2	All inverter controlled

10. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
11. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. When connected to a central control system, sequential start is activated for all system on each DIII network.

F. Electrical:

1. The power supply to the condensing unit shall be 208-230 volts, 3 phase, 60 hertz +/- 10%.

Power Supply Voltage	Voltage Range
208-230V/3/60	187V-253V

Model	MCA	MOP	Compressor RLA
REYQ120TTJU	43	50	15.0 + 15.0

2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
4. The control wiring lengths shall be as shown below.

	Condenser to Indoor Unit	Condenser to Central Controller	Indoor Unit to Remote Control
Control Wiring Length	6,665 ft	3,330 ft	1,665 ft
Wire Type	16/18 AWG, 2 wire, non-polarity, non-shielded, stranded		

2.5 CONDENSING UNIT – HEAT PUMP

- A. General: The condensing unit is designed specifically for use with VRV series components.
1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant accumulator.
 2. Liquid and suction lines must be individually insulated between the condensing and indoor units.
 3. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
 4. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
 5. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
 6. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input
 7. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
 8. The unit shall incorporate an auto-charging feature to ensure optimum performance. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation
 9. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
 10. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
 11. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
 12. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation
 13. The condensing unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
- B. Unit Cabinet:
1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Fan:
1. The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.

Model Number	Fan Motor Output (W) & Quantity
RXYQ192TTJU	(350 x 2) + (750 x 1)
RXYQ216TTJU	(350 x 2) + (350 x 2)

2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 22,283 CFM dependent on model specified
4. Nominal sound pressure levels shall be as shown below.

Model Number	Sound Pressure Level dB(A)
RXYQ192TTJU	63
RXYQ216TTJU	64

5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion Ulta Gold coating as standard with a salt spray test rating of 1000hr(ASTM B117), Acetic acid salt spray test: 500hr(ASTM G85)
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention.
6. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. Compressor:

1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. The target suction pressure should be capable of automatic reset based on outdoor temperature and system load to improve efficiency. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressors in the condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At

complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

4. The capacity control range shall be as low as 10% to 100%.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
7. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation
8. Compressor configurations

Tonnage	Number of Compressors	Compressor Types
18	2	All inverter controlled

9. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition for single module and manifolded systems.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours. When connected to a central control system sequential start is activated for all system on each DIII network

F. Electrical:

1. The power supply to the condensing unit shall be 208-230 volts, 3 phase, 60 hertz +/- 10%.

Power Supply Voltage	Voltage Range
208-230V/3/60	187V-253V

Model	MCA	MOP	Compressor RLA
RXYQ192TTJU	27.6 + 36.3	35+45	15.7+26.2
RXYQ216TTJU	36.3 + 36.3	45+45	23.8+26.2

2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation
4. The control wiring maximum lengths shall be as shown below.

	Condenser to Indoor Unit	Condenser to Central Controller	Indoor Unit to Remote Control
Control Wiring Length	6,665 ft	3,330 ft	1,665 ft
Wire Type	16/18 AWG, 2 wire, non-polarity, non-shielded, stranded		

2.6 BS (4/6/8/10/12) Q_T BRANCH SELECTOR BOX FOR VRV IV HEAT RECOVERY SYSTEM

- A. General: The BSQ36TVJ, BSQ60TVJ, BSQ96TVJ, BS4Q54TVJ, BS6Q54TVJ, BS8Q54TVJ, BS10Q54TVJ and BS12Q54TVJ branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.

1. These selector boxes shall be factory assembled, wired, and piped.
2. These BSQ_T / BS (4/6/8/10/12) Q54T branch controllers must be run tested at the factory.
3. These selector boxes must be mounted indoors.
4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.
5. The number of connectable indoor units shall be in accordance with the table below:

Model Number	Maximum Connectable Cooling Capacity	Maximum Number of Connectable Indoor Units Per Branch
BSQ36TVJ	36,000 Btu/h	4
BSQ36TVJ	36,000 Btu/h	4
BSQ96TVJ	96,000 Btu/h	8

- B. Unit Cabinet:

1. These units shall have a galvanized steel plate casing.
2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
3. The cabinet shall contain one sub cooling heat exchanger per branch.
4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
5. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer. These sound levels must not exceed the values below.

Model Number	Sound Level dB(A) Operating	Sound Level dB(A) Max
BSQ36TVJ	42	32
BSQ60TVJ	43	32
BSQ96TVJ	44	34
BS6Q54TVJ	39	47
BS8Q54TVJ	39	47
BS10Q54TVJ	40	48
BS12Q54TVJ	40	48

6. If an alternate manufacturer is selected, the mechanical contractor shall provide, at their own cost and expense, any additional material and labor to meet the published sound levels above.

- C. Dimensions:

1. Each BSQ_T unit shall be no larger than 8-1/8" x 15-1/4" x 12-13/16".
2. Each BS4Q_T shall be no larger than 11-3/4" x 14-9/16" x 18-15/16".

3. Each BS(6/8)Q_T shall be no larger than 11-3/4" x 22-13/16" x 18-15/16".
4. Each BS(10/12)Q_T shall be no larger than 11-3/4" x 32-5/16" x 18-15/16".

D. Refrigerant Valves:

1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
2. The refrigerant connections must be of the braze type.
3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.
4. Each circuit shall have at least one (36,000 Btu/h indoor unit or smaller for the BSQ36TVJ, 54,000 Btu/h indoor unit or smaller for the BS(4/6/8/10/12)Q54TVJ, 60,000 Btu/h indoor unit or smaller for the BSQ60TVJ and 96,000 Btu/h indoor unit or smaller for the BSQ96TVJ) branch selector box.
5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

E. Condensate Removal:

1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.7 FXMQ_M – CONCEALED CEILING DUCTED UNIT (Med. Static)

- A. General: Daikin indoor unit FXMQ_M shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 72,000 Btu/h to 96,000 Btu/h. Model numbers are FXMQ72MVJU and FXMQ96MVJU to be connected to outdoor unit model RXYQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72, BRC1E73 and BRC2A71. The indoor units sound pressure shall be 48 dB(A) at low speed measured 5 feet below the ducted unit.

- B. Performance: Each unit's performance is based on nominal operating conditions:

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
FXMQ72MVJU	72,000	96,000
FXMQ96MVJU	96,000	108,000

C. Indoor Unit:

1. The Daikin indoor unit FXMQ_M shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The indoor units shall be equipped with a return air thermistor.
5. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
6. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:

1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz, with a motor output of 0.51 HP.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.
5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
6. Fan motor external static pressure for nominal airflow:

Model Number	Fan ESP (in. WG)
FXMQ72MVJU	0.95 – 0.72
FXMQ96MVJU	0.95 – 0.8

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-5/16 inch outside diameter PVC.
5. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-1B (recommended).
 - a. The Daikin wall mounted, hard wired remote sensor kit is recommended for ceiling-embedded type fan coils, which often result in a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).

2.8 FXMQ_PB - CONCEALED CEILING DUCTED UNIT (Med. Static)

- A. General: Daikin indoor unit FXMQ_PB shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. Model numbers are FXMQ07PBVJU, FXMQ09PBVJU, FXMQ12PBVJU, FXMQ15PBVJU, FXMQ18PBVJU, FXMQ24PBVJU, FXMQ30PBVJU, FXMQ36PBVJU, FXMQ48PBVJU, and FXMQ54PBVJU to be connected to outdoor unit model RXYQ / RXYMQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72, BRC1E73 and BRC2A71. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening. The indoor units sound pressure shall range from 29 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.
- B. Performance: Each unit's performance is based on nominal operating conditions:

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
FXMQ07PBVJU	7,500	8,500
FXMQ09PBVJU	9,500	10,500
FXMQ12PBVJU	12,000	13,500
FXMQ15PBVJU	15,000	16,500
FXMQ18PBVJU	18,000	20,000
FXMQ24PBVJU	24,000	27,000
FXMQ30PBVJU	30,000	34,000
FXMQ36PBVJU	36,000	40,000

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
FXMQ48PBVJU	48,000	54,000
FXMQ54PBVJU	54,000	60,000

C. Indoor Unit:

1. The Daikin indoor unit FXMQ_PB shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipped with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet and has a built in safety shutoff and alarm.
5. The indoor units shall be equipped with a return air thermistor.
6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
7. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The unit shall be equipped with automatically adjusting external static pressure logic selectable during commissioning.
3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
4. The airflow rate shall be available in three settings.
5. The fan motor shall be thermally protected.
6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
7. Fan motor external static pressure range for nominal airflow:

Model Number	Fan ESP (in. WG)
FXMQ07PBVJU	0.40 – 0.12
FXMQ09PBVJU	0.40 – 0.12
FXMQ12PBVJU	0.40 – 0.12
FXMQ15PBVJU	0.80 – 0.20

Model Number	Fan ESP (in. WG)
FXMQ18PBVJU	0.80 – 0.20
FXMQ24PBVJU	0.80 – 0.20
FXMQ30PBVJU	0.80 – 0.20
FXMQ36PBVJU	0.80 – 0.20
FXMQ48PBVJU	0.80 – 0.20
FXMQ54PBVJU	0.56 – 0.20

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 15 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with an 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-4B (recommended).
 - a. The Daikin wall mounted, hard wired remote sensor kit is recommended for when a NAV controller is not used or when the NAV controller is not located in the space that is being controlled. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).
2. MERV 13 Filter kit. Can be configured for right or left access. Filters replaceable without tools.
3. Air side Economizer designed for connection to the rear of FXMQ30-54PBVJU.

2.9 FFXQ_T – ROUND FLOW SENSING CEILING CASSETTE UNIT

- A. General: Daikin indoor unit model FXFQ_T shall be a round flow ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, direct drive DC (ECM) type fan, for installation into the ceiling cavity equipped with an air panel grill. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. Model numbers are FXFQ07TVJU, FXFQ09TVJU, FXFQ12TVJU, FXFQ15TVJU, FXFQ18TVJU, FXFQ24TVJU, FXFQ30TVJU, FXFQ36TVJU, FXFQ48TVJU to be connected to outdoor unit model RXYQ / RXYMQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a round flow air distribution type, fresh white, impact resistant decoration panel, or optional self-cleaning filter panel. The supply air is distributed via four individually motorized louvers. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72, BRC1E73, BRC2A71 and BRC1E52B7. The indoor units sound pressure shall range from 30 dB(A) to 45 dB(A) at High speed measured at 5 feet below the unit.
- B. Performance: Each unit's performance is based on nominal operating conditions:
- C. Indoor Unit:
1. The Daikin indoor unit FXFQ_T shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Both refrigerant lines shall be insulated from the outdoor unit.
 4. The round flow supply air flow can be field modified to 23 different airflow patterns to accommodate various installation configurations including corner installations.
 5. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.
 6. The indoor units shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump provides up to 33-1/2" of lift from bottom of unit to top of drain piping and has a built in safety shutoff and alarm.
 7. The indoor units shall be equipped with a return air thermistor.
 8. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 9. The voltage range will be 253 volts maximum and 187 volts minimum.
 10. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor.
 11. Supplied air shall be directed automatically by four individually controlled louvers.
- D. Unit Cabinet:
1. The unit cabinet shall be space saving and shall be located into the ceiling.
 2. Four auto-adjusted louvers shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
 3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
 4. Fresh air intake shall be possible by way of Daikin's optional fresh air intake kit.
 5. A branch duct knockout shall exist for branch ducting of supply air.
 6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
 7. Optional high efficiency air filters are available for each model unit.
- E. Fan:
1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
FXFQ07TVJU	7,500	8,500
FXFQ09TVJU	9,500	10,500
FXFQ12TVJU	12,000	13,500
FXFQ15TVJU	15,000	16,500
FXFQ18TVJU	18,000	20,000
FXFQ24TVJU	24,000	27,000
FXFQ30TVJU	30,000	34,000
FXFQ36TVJU	36,000	40,000
FXFQ48TVJU	48,000	54,000

2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.08 to 0.16 HP.
3. The airflow rate shall be available in three manual settings.
4. The DC fan shall be able to automatically adjust the fan speed in 5 speeds based on the space load.
5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings to allow operation with the high efficiency air filter options.
6. The fan motor shall be thermally protected.

F. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.
2. Optional high efficiency disposable air filters shall be available.
3. Optional Self-Cleaning Filter Panel, which performs automatic filter cleaning up to once a day, with dust collection box that indicates when to be emptied.

G. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2, or 3-row cross fin copper evaporator coil with up to 21 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1 - 1/4 inch outside diameter PVC.
5. A condensate pan with antibacterial treatment shall be located under the coil.
6. A thermistor will be located on the liquid and gas line.

H. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

I. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

4. For the Sensing functions and the optional Self-Cleaning Filter functions, Remote controller BRC1E73/BRC1E52B7 shall be used. Consult with Daikin prior to applying controls.

J. Optional Accessories Available:

1. A high efficiency disposable air filter kit
2. Air intake kit
3. Self-Cleaning Filter Panel, which performs automatic filter cleaning up to once a day, with dust collection box that indicates when to be emptied.
4. Remote "in-room" sensor kit (KRCS01-4B).
 - a. The Daikin wall mounted, hard wired remote sensor kit is recommended for when a NAV controller is not used or when the NAV controller is not located in the space that is being controlled. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).

2.10 FXZQ – 4 WAY CEILING CASSETTE UNIT (2'x2')

- A. General: Daikin indoor unit model FXZQ shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grill. It shall be available in capacities from 7,500 Btu/h to 18,000 Btu/h. Model numbers are FXZQ07M7VJU, FXZQ09M7VJU, FXZQ12M7VJU, FXZQ18M7VJU to be connected to outdoor unit model RXYQ / RXYMQ / RWEYQ heat pump and REYQ / RWEYQ heat recovery model. It shall be a four-way air distribution type, white (RAL9010), impact resistant with a washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E71 and BRC2A71. The indoor units sound pressure shall range from 29 dB(A) to 34 dB(A) at low speed measured at 5 feet below the unit.

- B. Performance: Each unit's performance is based on nominal operating conditions:

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
FXZQ07M7VJU	7,500	8,700
FXZQ09M7VJU	9,500	11,100
FXZQ12M7VJU	12,000	14,000
FXZQ18M7VJU	18,000	21,000

C. Indoor Unit:

1. The Daikin indoor unit FXZQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.

4. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
 5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
 6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift and has a built in safety shutoff and alarm.
 7. The indoor units shall be equipped with a return air thermistor.
 8. All electrical components are reached through the decoration panel, which reduces the required side service access.
 9. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 10. The voltage range will be 253 volts maximum and 187 volts minimum.
- D. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
 2. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
 3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
 4. Fresh air intake shall be possible by way of direct duct installation to the side of the indoor unit cabinet.
 5. A branch duct knockout shall exist for branch ducting supply air.
 6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
 2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.06 to 0.12 HP.
 3. The airflow rate shall be available in high and low settings.
 4. The fan motor shall be thermally protected.
- F. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
- G. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 3. The coil shall be a 2-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
 4. The refrigerant connections shall be flare connections and the condensate will be 1 - 1/32 inch outside diameter PVC.
 5. A condensate pan shall be located under the coil.
 6. A condensate pump with a 21-inch lift shall be located below the coil in the condensate pan with a built in safety alarm.
 7. A thermistor will be located on the liquid and gas line.
- H. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

- I. Control:
 - 1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 - 2. The unit shall be compatible with interfacing with a BMS system via optional BACnet gateways.
 - 3. The unit shall be compatible with a Daikin intelligent Touch advanced multi-zone controller or an intelligent Manager III customizable BMS. Consult with Daikin prior to applying controls.
- J. Optional Accessories:
 - 1. Direct fresh air intake kit (KDDQ44X60).

2.11 LOCAL REMOTE CONTROLLERS

- A. Daikin AC VRV local remote controllers are compatible with all VRV indoor units. The remote controller wiring consist of a non-polar two-wire connection to the indoor unit. The local remote controllers may be wall-mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). Set temperatures can be adjusted in increments of 1°F. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address. The local remote controllers do not require addressing.
- B. BRC1E72: New Navigation (NAV) Remote Controller: The NAV Remote Controller can provide control for all VRV indoor units. The remote controller wiring consist of a non-polar two-wire connection to the indoor unit at terminals P1/P2. The NAV Remote Controller is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). The NAV Remote Controller does not require addressing.
- C. The NAV Remote Controller can be used in conjunction with the BRC2A71 (Simplified Remote Controller) or another NAV Remote Controller to control the same indoor unit group. No more than 2 remote controllers can be placed in the same group.
 - 1. Mounting: The NAV Remote Controller shall be mounted into a standard 2" x 4" junction box.
 - 2. Display Features:
 - a. The NAV Remote Controller shall be approximately 4.75" x 4.75" in size with a backlit 2.75" x 1.75" LCD display.
 - b. Feature Backlit LCD Display with contrast adjustment and auto off after 30 seconds.
 - c. Display information shall be selectable from English, French, or Spanish.
 - d. Configurable display mode – Detailed, Standard, and Simple
 - 1) Large 11/16" room temperature displayed in Simple display
 - e. The controller shall display Operation Mode, Setpoint, and Fan Speed.
 - 1) Displayed items configurable
 - 2) Configure "Off" to be displayed when unit is turned off (field setting required)
 - a) Prevents mode adjustment
 - 3) Setpoint can be removed from display when unit is turned Off (field setting required)
 - a) Prevents setpoint adjustment
 - 4) Fan speed display removable (field setting required)
 - a) Prevents fan speed adjustment
 - f. System Status icons.
 - g. The controller shall display temperature setpoint in one degree increments with a range of 60-90oF (16-32oC)
 - h. Detailed and Simple display will reflect room temperature (0-176oF/-18-80oC range in one-degree increment).
 - 1) Display of temperature information shall be configurable for Fahrenheit or Celsius

- i. On/Off status shall be displayed with an LED.
 - j. Error codes will be displayed in the event of system abnormality/error with a two-digit code.
 - 1) A blinking LED will also signal system abnormality/error
 - k. The following system temperatures can be displayed to assist service personnel in troubleshooting:
 - 1) Return Air Temperature
 - 2) Liquid Line Temperature
 - 3) Gas Line Temperature
 - 4) Discharge Air Temperature (depending on unit),
 - 5) Remote Controller Sensor Temperature
 - 6) Temperature used for Indoor Unit Control
3. Basic Operation:
- a. Capable of controlling a group of up to 16 indoor units.
 - b. Controller shall control the following group operations:
 - 1) On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto* (*with VRV Heat Recovery & Heat Pump Systems))
 - a) Configure only the essential modes to be selectable – remove unnecessary mode selection(s) from display
 - 2) Independent Cooling and Heating setpoints in the occupied mode
 - a) Dual setpoints (individual Cool and Heat setpoints with minimum setpoint differential 0 – 8oF (0 – 4oC) default 2oF (1oC)) or Single setpoint
 - 3) Independent Cooling Setup and Heating Setback setpoints in the unoccupied mode
 - 4) Fan Speed
 - 5) Airflow direction (dependent on indoor unit type).
 - 6) The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period
 - 7) Function button lockout (On/Off, Mode, Fan Speed, Up/Down, Left, Right Arrows)
 - 8) Optional Controller Face Decal (BRC1E72RM, BRC1E72RF, BRC1E72RMF, BRC1E72RM2, BRC1E72RF2, BRC1E72RMF2) to hide unnecessary (locked out) buttons
 - 9) Indoor Unit group assignment
 - 10) Clock (12/24 hour) and Day display
 - 11) Automatic adjustment for Day Light Savings Time (DST)
 - a) Set changeover period (second Sunday in March / first Sunday in November)
4. Programmability:
- a. Controller shall support schedule settings with selectable weekly pattern options.
 - 1) 7-day
 - 2) Weekday + Weekend
 - 3) Weekday + Saturday + Sunday
 - 4) Everyday
 - 5) The schedule shall support unit On/Off
 - 6) Independently settable Cooling and/or Heating setpoints when unit is on (occupied)
 - 7) Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied)
 - 8) A maximum of 5 operations can be schedulable per day
 - 9) Time setting in 1-minute increments
 - b. The Controller shall support auto-changeover mode for both Heat Pump and Heat Recovery systems allowing the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint.

- 1) Changeover to cooling mode shall occur at cooling setpoint + 1oF (0.5oC) as the primary changeover deadband and takes the guard timer into consideration
 - a) Configurable from 1 – 4oF (0.5 – 2oC)
- 2) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1oF (0.5oC) as the secondary changeover deadband.
 - a) Configurable from 1 – 4oF (0.5 – 2oC)
- 3) Changeover to heating mode shall occur at heating setpoint - 1oF (0.5oC) as the primary changeover deadband and takes the guard timer into consideration
 - a) Configurable from 1 – 4oF (0.5 – 2oC)
- 4) Changeover to heating mode shall occur at the primary changeover deadband to heating - 1oF (0.5oC) as the secondary changeover deadband.
 - a) Configurable from 1 – 4oF (0.5 – 2oC)
- 5) 1 hour guard timer:
 - a) Upon changeover, guard timer will prevent another changeover during this period.
 - b) Guard timer is ignored by a change of setpoint manually from either the Multi-zone Controller, Remote Controller, or by schedule.
 - c) The Guard timer is also ignored if the space temperature reaches the secondary changeover deadband (configurable from 1 - 4oF (0.5 – 2oC)) from the primary changeover deadband, and the guard timer has been activated
 - d) 60 minutes as default, configurable to 15, 30, or 90 minutes
- c. The Controller shall support an Auto Off Timer for temporarily enabling indoor unit operation during the unoccupied period.
 - 1) When the Off Timer is enabled and when the unit is manually turned on at the remote controller
 - 2) The controller shall shut off the unit after a set time period
 - 3) The time period shall be configurable in the controller menu with a range of 30-180 minutes in 10 minute increments
- d. The room temperature shall be capable of being sensed at either the NAV Remote Controller, the Indoor Unit return air temperature sensor (default), or Remote Temperature Sensor (KRCS01-1B) configured through the field settings.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the Owner, if suitability is doubted. Contractor shall notify the Owner before installation into any apparent improper locations of interference with other work such as electrical outlets, windows, cabinetwork or other features.

3.2 INSPECTION

- A. All equipment shall be installed meeting strict conformance with manufacturer's recommendations. All equipment shall be installed level and plumb. Fans will be grounded as recommended by the manufacturer.
- B. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

3.3 INSTALLATION OF EQUIPMENT

- A. Install all equipment in the locations indicated on the approved shop drawings.
- B. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- C. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly and that all adjustments have been made.
- D. All mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators.
- E. Install equipment so that nameplates are easily visible.
- F. Where not otherwise indicated, equipment and material installation is published manufactures' recommendations. This requirement includes details, clearances and accessories.

3.4 CUTTING, PATCHING AND DAMAGE

- A. All necessary cutting and patching of walls, floors, partitions, ceilings, etc., as required for the proper installation of work under this section shall be done under this section. No cutting of structural members will be permitted without the written permission of the Architect.
- B. Any existing work or equipment damaged during the progress of construction or testing shall be replaced with like material, free of charge to the Owner or other trades.

3.5 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.6 REFRIGERANT PIPING

- A. Install piping to conserve building space and not to interfere with use of space. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient. Wherever practical, group piping at common elevations and locations. Slope piping one percent in direction of refrigerant return.
- B. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum using halide torch or electronic leak detector. Test to no leakage.
- C. Variable Refrigerant Systems: Install in accordance with manufacturer's instructions.

3.7 CLEANING

- A. Completely cover motor and other moving machinery to protect from dirt during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.

- B. During the process of work, premises shall be kept reasonably free of all debris, cuttings and waste material resulting from work under this heading. All debris, rubbish, leftover material tools and equipment shall be removed from the site prior to final acceptance.
- C. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.
- D. Damaged factory applied finished shall be "touched up". "Touched up" shall be accomplished with preparation, prime and finish coats applied in strict accordance with manufactures recommendations.

END OF SECTION

08/27/18

SECTION 23 81 03

PACKAGED ROOFTOP AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Section, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete, finished and workman-like installation. Work under this section includes all labor, equipment, material, services, transportation, etc. required for any reasonably incidental to the complete and satisfactory installation of all of the HVAC Systems as indicated on the Drawings or specified herein.
 - 1. Package Gas/Electric Rooftop Air Conditioning units.
 - 2. Vibration Isolation.
 - 3. Test and Balance.
 - 4. Submittals and Shop Drawings.
 - 5. Record Drawings.
 - 6. Operation and Maintenance Manuals.
 - 7. Vibration isolation, supports and hangers.
 - 8. Seismic restraining devices.
 - 9. Caulking
 - 10. Guarantee

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 05 00, GENERAL MECHANICAL PROVISIONS
- B. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING
- C. Section 23 07 00, MECHANICAL INSULATION
- D. Section 23 09 00, HVAC INSTRUMENTATION AND CONTROLS
- E. Section 23 31 00, DUCTWORK AND ACCESSORIES

1.4 WORK DONE BY OTHER DIVISIONS OR SECTIONS

- A. The following work, which is sometimes included in the Air Conditioning Section, will in this case be furnished under other Divisions or Sections. Installation will be by other Divisions or Sections unless specifically noted to be performed by this Section.
 - 1. Finish painting of air conditioning installation unless specifically mentioned or shown.
 - 2. Door louvers and exterior wall louvers.
 - 3. Electrical.

1.5 GENERAL REQUIREMENTS

- A. This section of the specification shall be considered as a part of the entire specification and all applicable portions of General Conditions, Special Conditions, and Division 1 shall apply.
- B. Erection: The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the erection of the work, together with all necessary journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start of operate and test the work involved.

1.6 REFERENCES

- A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
- C. AMCA 300 - Test code for sound rating air-moving devices.
- D. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation System.
- E. ARI 270 - Sound rating of Outdoor Unitary Equipment.
- F. ASHRAE 52-76 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- G. SMACNA - Low Pressure Duct Construction Standards.
- H. California Mechanical Code - 2016 Edition.

1.7 SUBMITTALS AND SHOP DRAWINGS

- A. Contractor agrees that shop drawings submittals processed by the District do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the District to monitor the Contractor's progress and understanding of the design. The process of review of the Contractor's submittals is not of testing the District's perception. If deviations, discrepancies or conflicts between shop drawings submittals and the Contract Documents are discovered either prior to or after the shop drawing submittals is processed by the District, the Contractor agrees that the Contract Documents shall control and shall be followed.
- B. Materials and Equipment: As soon as possible and within 35 days after award of the contract, and before their purchase, the Contractor shall submit to the District seven bound booklets for approval containing a complete list of materials, specialties and equipment he is to furnish for the installation. Literature shall be standard manufacturer's catalog cuts and items to be installed shall be clearly indicated. All submittals shall be made at one time.
- C. Each item shall be identified by manufacturer, brand and trade name, number, size, rating and whatever other data is necessary to properly identify and check the materials and equipment. The words: "as specified" will not be considered sufficient identification.
- D. Accessories, controls, finish, etc., not submitted or identified with the submitted equipment shall be furnished and installed as specified.
- E. Shop drawings shall be approved only to extent of information indicated. Approval of an item of equipment shall not be construed to mean approval for components for that item for which Contractor has provided no information.

- F. Approval of shop drawings shall not relieve Contractor of responsibility for providing all controls, wiring, components, etc. which are shown or specified, or all additional controls, wiring, components, etc. required to provide complete and correctly operating mechanical systems.
- G. Submit product data for the following manufactured products, assemblies, personnel and testing agencies required for this project.
 - 1. Packaged Gas/ Electric Air Conditioning units.
 - 2. Controls.
 - 3. Detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guarantee.

1.8 CLOSEOUT SUBMITTALS

- A. Equipment Identification and Operation Instructions: Furnish the District with a hard bound brochure titled "Mechanical System" which shall contain the following information typed, indexed, tabbed and bound inside:
 - 1. An alphabetical list of all equipment excepting pipe and fittings: the manufacture; the catalog number; and the local distributing agent, including his address and telephone number.
 - 2. Manufacturer's instructions for all items requiring maintenance. This shall include, but not be limited to, all motor driven equipment, controls, pressure regulating devices, packaged equipment, etc. Where manufacturer's directions are not clear, are incomplete or do not exist, develop information necessary to service, clean, adjust, etc., all items. Delete all information in manufacturer's literature, which is not applicable. Identify all equipment in the manual. List the time intervals that all maintenance tasks should be performed.
 - 3. Submit three (3) copies of the brochure to the Architect for approval and furnish the District with at least two (2) corrected brochures.
 - 4. Provide for and fasten to each piece of equipment a permanent name plate fabricated of engraved laminated plastic, white between black laminations, indicating the identifying mark and the area or spaces served by the equipment.

1.9 SUBSTITUTIONS

- A. Should the Contractor desire to substitute any material, equipment or other items for those specified, he shall submit a complete list, including detailed equipment layouts and performance characteristics within 35 calendar days after the scheduled Start of Construction. Said data shall be submitted in 7 copies, assembled in individual brochures.
- B. The entire cost of all changes of any type due to substitution for materials specified shall be born by the Contractor at no extra cost to the District.
- C. Unsolicited and voluntary deducts, on the part of the Contractor for substituting unapproved systems and/or equipment, shall not be considered for the purpose of awarding the Contract.
- D. The contractor shall submit the amount of cost credit to the Contract in the event the proposed substitution is accepted.
- E. In all cases where substitutions are proposed after bids are received, the Contractor shall bear the cost of evaluation on the basis of 2-1/2 times technical salaries of engineering personnel involved.

1.10 AVAILABILITY OF SPECIFIED EQUIPMENT

- A. Verify prior to bidding that all specified equipment is available and can be obtained in time for installation during orderly and timely progress of the work.
- B. In the event that specified items will not be so available, notify the District prior to receipt of bids
- C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by proper investigation on the part of the Contractor, will be back-charged as necessary and shall not be born by the District.

1.11 RECORD DRAWINGS

- A. The contractor shall arrange and pay for one set of white prints of the HVAC drawings, which he shall alter in red to show all changes made to the original layout. These drawings shall be kept current.
- B. The contractor shall deliver these completed to the District when the job is finished and accepted prior to final payment.

1.12 OPERATION AND MAINTENANCE DATA

- A. Submit two sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, binders with durable plastic covers. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", and title of project. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- B. Contents: Prepare a Table of Contents with each Product or system description identified.
 1. Part 1: Directory listing names, addresses, and telephone numbers of District, Contractor, Sub-contractors, and major equipment suppliers.
 2. Part 2: Operation and maintenance instructions, arranged by system. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
- C. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with District comments. Revise content of documents as required prior to final submittal.
- D. Submit final volumes (revised) within ten days after final inspection.

1.13 LOCAL CONDITIONS

- A. The Contractor and trade submitting tenders on this work shall visit and will be deemed to have visited the site to ensure that they are familiar with all conditions relating to the work. Failure to visit the site will in no way relieve the successful Contractor of the necessity of furnishing any material or performing any work that may be required to complete the work in accordance with the drawings and specifications without additional cost to the District.

1.14 RULES, REGULATIONS AND CODES

- A. All work and materials shall be in full accordance with the latest California Mechanical Code, California Plumbing Code, California Building Code and local rules and regulations, State Fire Marshal regulations, the safety orders of the Division of Industrial Safety; the National Electric Code; the standards of the National Fire Protection Association; American Gas Association; Occupation and Safety Act; American National Standards Institute; American Society of Mechanical Engineers; American Society for Testing and Materials; Installation Standards published by the International Association of Plumbing And Mechanical officials (IAPMO) and other applicable laws, codes, or regulations. Nothing in these specifications shall be construed to permit work not conforming to these codes.
- B. Electrical Work: Motors, electrical apparatus and wiring specified in this section shall conform to the National Electrical Manufacturer's Standards and the National Electric Code and bear the Underwriter's label of approval.
- C. The Contractor shall furnish, without extra charge, any additional material and labor when and where required to comply with these rules and regulations, though the work be not mentioned in these Specifications or shown on the Drawings. When these Specifications or Drawings call for or describe materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of these specifications and accompanying drawings shall take precedence.

1.15 FEES AND PERMITS

- A. The Contractor must obtain and pay all fees for permits, licenses, inspections, etc., which are required by any legally constituted authority. Coordinate exact requirements with the District prior to bid.

1.16 COORDINATION

- A. Following the general arrangement indicated on the Drawings as closely as possible, the Contractor shall coordinate with the architectural, structural, plumbing, electrical and all other trades prior to installation of the materials and equipment to verify adequate space available for installation of the work shown. The District shall be immediately notified if an area of conflict occurs between trades.
- B. The Contractor shall bear all costs incurred for work that must be relocated due to conflicts between trades.
- C. The Mechanical Contractor shall coordinate all requirements for all points of connection with the General Contractor and other trades prior to bid.

1.17 DRAWINGS

- A. The work shall be installed as indicated on Drawings, however, changes to accommodate installation of this work with other work, or in order to meet Architectural or structural conditions, shall be made without additional cost to the District.
- B. For the purpose of clarity and legibility, the Drawings are essentially diagrammatic to the extent that many offsets, bends, unions, special fittings and exact locations are not indicated. The Contractor shall make use of all data in all of the Contract Documents, and shall verify this information at the site.

1.18 INSPECTION

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.19 DELIVERY, STORAGE AND PROTECTION OF PROPERTY

- A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet construction schedule, together with any special handling charges, shall be borne by the contractor.
- B. Materials shall be delivered in ample quantities from time to time as may be necessary for the uninterrupted progress of the work. They shall be stored as to cause the least obstruction to the premises and distributed so as to prevent overloading to any portion of the structure.
- C. The Contractor shall provide temporary storage and shop areas that are required at the site for the safe and proper storage of materials, tools, and other items used in the performance of this work. These areas shall be constructed only in approved locations and shall not interfere with the work of any other Contractor.
- D. All work, equipment and materials shall be protected at all times. The Contractor shall make good all damage caused either directly or indirectly by his own workmen. The Contractor shall also protect his own work from damage. He shall close all pipe and duct openings with caps or plugs during installation. He shall protect all of his equipment and materials against dirt, water, chemical, and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

1.20 DAMAGE BY LEAKS

- A. Refer to Section 23 05 00.

1.21 ACCESS TO EQUIPMENT FOR MAINTENANCE

- A. Install all equipment, piping, etc. to permit access for normal maintenance. Maintain easy access to filters, motors, etc. Install all such equipment and accessories to facilitate maintenance. Perform any relocation of pipes, etc. required to permit access at request of District at no additional cost to District.
- B. Furnish and install access doors or panels in walls, floors, and ceilings to permit access to equipment, dampers, and all other items requiring service. Coordinate location of access doors with other trades as required.
- C. Size access panels to allow inspection and removal of all items served.
- D. Refer to Section 23 0500.

1.22 GUARANTEES

- A. The Contractor, in accepting this contract, binds himself to replace or repair at his own expense any defect in workmanship or material which may appear within a period of two (2) years from the date of the final acceptance of the building, and to pay for all resulting damage which shall appear within the said period; provided always that the Contractor shall not be liable for anything attributable to acts of the agents of the District, or for ordinary wear. Also, given date of work performed by the Contractor be accepted as complete, he shall agree to correct any deficiencies or omissions in respect to the plans or specifications which may appear in the afore-mentioned twenty-four month period.
- B. The Contractor guarantees that all piping as provided in this specification will be free from all obstructions, and that all piping will be tight and drip free.
- C. All refrigerant compressors shall carry a five-year manufacturer's warranty.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and equipment shall be new and of the best of their respective grades, free from all defects and of the make, brand or quality herein specified or as accepted by the District.
- B. All materials and equipment shall be identified by manufacturer's name or nameplate data. Unidentified material or equipment shall be removed from the site.
- C. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in the catalog as standard with the equipment. Optional or additional accessories shall be furnished as specified.
- D. Where no specific make of material or equipment is mentioned, any first class product of a reputable manufacturer may be used, provided it conforms to the requirements of the system and meets with the approval of the District.
- E. Equipment and materials damaged during transportation, installation and operation shall be considered as "totally damaged" and shall be replaced with new. Any variance from this clause shall be made only with written approval of the District.

2.2 PACKAGE ROOFTOP GAS/ELECTRIC AIR CONDITIONING UNITS- TRANE 4YSC

A. GENERAL UNIT DESCRIPTION

- 1. Packaged rooftop units cooling, heating capacities, and efficiencies are AHRI Certified within scope of AHRI Standard 210-240 for 3 to 5 ton units or 340-360 (I-P) or 6 to 10 ton units and ANSIZ21.47 and 10 CFR Part 431 pertaining to Commercial Warm Air Furnaces (all gas heating units)
- 2. Convertible airflow
- 3. Microprocessor controls operating range between 115°F and 0°F in cooling mode standard from the factory
- 4. Electromechanical controls operating range between 115°F and 40°F
- 5. Factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory
- 6. Colored and numbered wiring internal to the unit for simplified identification
- 7. Units cULus listed and labeled, classified in accordance for Central Cooling Air Conditioners

B. Casing

1. Zinc coated, heavy gauge, galvanized steel
2. Weather-resistant baked enamel finish on phosphatized exterior surfaces
3. Meets ASTM B117, 672 hour salt spray test
4. Removable single side maintenance access panels
5. Lifting handles in maintenance access panels (can be removed and reinstalled by removing two fasteners while providing a water and air tight seal)
6. Exposed vertical panels and top covers in the indoor air section insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material
7. Base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.
8. Base of the unit insulated with 1/8 inch, foil-faced, captured and sealed, closed-cell insulation
9. Unit base provisions for forklift and/or crane lifting on three sides of unit

C. Coils

1. Evaporator and Condenser
 - a. Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin
 - b. Evaporator coils standard for all 3 to 10 ton standard efficiency models
 - c. Coils leak tested to 600 psig
 - d. Assembled unit leak tested to 465 psig
 - e. Condenser coil—patent pending 1+1+1 hybrid coil designed with slight gaps for ease of cleaning
 - f. Standard plastic, dual-sloped, removable and reversible condensate drain pan with through-the-base condensate drain
2. Microchannel Condenser
 - a. Standard for 3 to 10 ton standard efficiency models and 4,5,6, 7.5, 8.5 ton high efficiency models
 - b. Not offered on the 4 and 5 ton dehumidification models
 - c. Optimal heat transfer performance due to flat, streamlined tubes with small ports, and metallurgical tube-to-fin bond
 - d. Reduce system refrigerant charge by up to 50% leading to better compressor reliability
 - e. Compact all-aluminum microchannel coils reduce the unit weight
 - f. Recyclable all aluminum coils All aluminium construction minimizes galvanic corrosion
 - g. Strong aluminum brazed structure provides better fin protection RT-PRC023AN-EN 213
 - h. Flat streamlined tubes more dust resistant and easy to clean
 - i. Coils leak tested at the factory to ensure the pressure integrity

D. Compressors

- a. All units have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps
- b. Suction gas-cooled motor with voltage utilization range of plus or minus 10 percent of unit nameplate voltage
- c. Internal overloads standard with scroll compressors
- d. Crankcase heaters optional on 3 to 10 ton standard efficiency units and standard on 3 to 10 ton high efficiency units
- e. Dual compressors recommended for humidity control, light load cooling conditions and system back-up applications
- f. Three stages of cooling available on 6 to 10 ton high efficiency units with dual compressors

E. Controls

1. Units factory-wired with necessary controls and contactor pressure lugs or terminal block for power wiring
2. External location available for mounting a fused disconnect device

3. Choice of electromechanical or microprocessor controls
- F. Electromechanical
1. 24-volt control circuit shall include control transformer and contactor pressure lugs for power wiring
 2. Units shall have single point power entry as standard
- G. Microprocessor
1. 24V control functions
 2. Resident control algorithms shall make all heating, cooling, and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures
 3. Control algorithm maintains accurate temperature control, minimizes drift from set point, and provides better building comfort
 4. Anti-short cycle timing and time delay between compressors provide a higher level of machine protection
- H. Filters
1. 2-inch MERV 13 filters
- I. Gas Heating Section
1. Progressive tubular heat exchanger, stainless steel burners and corrosion resistant steel
 2. Induced draft combustion blower shall be used to pull the combustion products through the firing tubes
 3. Heater shall use a direct spark ignition (DSI) system
 4. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition
 5. After three unsuccessful ignition attempts, entire heating system shall be locked out until manually reset at the thermostat/zone sensor
 6. Units shall be suitable for use with natural gas or propane (field-installed kit)
 7. Comply with the California requirement for low NOx emissions (gas/electric only)
- J. Indoor Fan
1. Direct drive plenum fan design – 10 tons, 6 ton (074), 7.5 to 8.5 ton high efficiency units
 2. Plenum fan design— backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor
 3. Plenum fan design— variable speed adjustment potentiometer located in the control box
 4. Belt drive units – 3 to 5 ton units (high efficiency 3-phase with optional motor) and 6 to 8.5 tons, standard efficiency
 5. Multispeed, direct drive motors— FC centrifugal fans with adjustable motor sheaves. 3 to 5 ton units (standard and high efficiency)
 6. Motors thermally protected.
 7. Variable speed direct drive motors— 10 tons, 6 ton (074), 7.5 to 8.5 (high efficiency)
 8. Indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT)
- K. Outdoor Fan
1. Direct-drive, statically balanced, draw-through in the vertical discharge position
 2. Permanently lubricated, built-in thermal overload protection included
- L. Phase Monitoring Protection
1. 3-phase power equipped with phase monitoring protection as standard
 2. Protect motors and compressors against problems caused by phase loss, phase imbalance and phase reversal indication
- M. Refrigerant Circuits
1. Thermal expansion valve standard

2. Service pressure ports, and refrigerant line filter driers factory-installed standard
 3. Area provided for replacement suction line driers
- N. Unit Top
1. One piece construction or where seams exist, it shall be outside the indoor air-conditioned section
 2. Ribbed top adds extra strength and prevents water from pooling
- O. Factory Installed Options
1. CompleteCoat™ Coils
 - a. Cathodic epoxy type electro-disposition coating formulated for high edge build to plate fin and tube heat exchangers
 - b. Coating provides excellent resistance and durability to corrosive effects of alkalies, acids, alcohols, petroleum, seawater, salt air and corrosive environments
 - c. Option is available for the plate fin-tube condenser coil and the microchannel type condenser coil
 2. Condensate Overflow Switch
 - a. If a clogged condensate drain line is preventing proper condensate removal from the unit this option will shut the unit down
 3. Heat Exchanger
 - a. Compact cabinet features a tubular heat exchanger in low, medium and high heat capacities
 - b. Stainless steel burners and corrosion-resistant aluminized steel tubes standard on all models
 - c. Induced draft blower to pull the gas mixture through the burner tubes
 - d. Direct spark ignition system doubles as a safety device to validate the flame
 - e. Gas/electric Precedent™ models exceed all California seasonal efficiency requirements and perform better than required to meet the California NOx emission requirements
 4. Hinged Access Doors
 - a. Sheet metal hinges available on the filter/evaporator, supply fan/heat, and the compressor/ control access doors
 5. Powered or Unpowered Convenience Outlet
 - a. Powered or unpowered GFCI, 120V/15amp, 2 plug, convenience outlet
 - b. When convenience outlet is powered, a service receptacle disconnect will be available
 - c. Convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker
 - d. Available to order when through-the-base electrical with disconnect switch or circuit breaker option is ordered
 6. Multi-Speed Indoor Fan System
 - a. Automatically switch operation of the indoor fan between high speed and low speed, based on the number of compressors operating
 - b. Operate at high speed whenever the gas or electric heater is operating
 7. Supply, Return and Plenum Air Smoke Detector
 - a. All unit operation will shut down if smoke is detected
 - b. Reset manual at unit
 - c. In order for supply or return air smoke detector to properly sense smoke in the supply/return air stream, entering air velocity must be between 500 - 4000 feet per minute
 - d. Equipment covered in this manual will develop an airflow velocity that falls within these limits over the entire airflow range specified in the evaporator fan performance table
 - e. Supply and/or return smoke detectors may not be used with plenum smoke detector

8. Through-the-Base Electrical Access
 - a. Electrical access for control and main power connections inside the curb and through-the-base of the unit
 - b. Field installation of liquid-tight conduit
 - c. External field-installed disconnect switch
- P. Factory or Field Installed Options
 1. Economizer (Standard)
 - a. Available with or without barometric relief.
 - b. Fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and fixed dry bulb control
 - c. Barometric relief shall provide a pressure operated damper that shall be gravity closing
 - d. Barometric relief shall prohibit entrance of outside air during the equipment "off" cycle
 - e. Arrives in shipping position and shall be moved to the operating position by the installing contractor
 2. Low Leak Economizer
 - a. Meets low leak requirements for ASHRAE 90.1, IECC, and CA Title 24 standards (3 cfm/ ft²@1" wg exterior air, 4 cfm/ft²@1" wg return air)
 - b. 100% outdoor air supply from 0-100% modulating dampers
 - c. Standard with barometric relief
 - d. Can be paired with powered exhaust for additional building pressure relief
 - e. Can be paired with or without Fault Detection & Diagnostics (FDD) to meet current mandatory CA Title 24 requirements
 - f. Available on downflow units only
- Q. Field Installed Options
 1. Powered Exhaust
 - a. Available for 3 to 10 ton units
 - b. Shall provide exhaust of return air, when using an economizer
 - c. Maintain better building pressurization
 2. Roof Curb
 - a. Designed to mate with the unit's downflow supply and return
 - b. Provide support and a water tight installation when installed properly
 - c. Shall allow field-fabricated rectangular supply/return ductwork to be connected directly to the curb
 - d. Curb shall be shipped knocked down for field assembly
 - e. Shall include wood nailer strips

2.3 PACKAGE ROOFTOP GAS/ELECTRIC AIR CONDITIONING UNITS- TRANE YSH

A. GENERAL UNIT DESCRIPTION

1. The units shall be dedicated downflow or horizontal airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for all units. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation and control sequence, before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be UL listed and labeled, classified in accordance to UL 1995/C 22.2, 236-05 3rd Edition. Packaged Rooftop units cooling, heating capacities, and efficiencies are AHRI certified within scope of AHRI Standard 340/360 (I-P) and ANSI Z21.47 and 10 CFR Part 431 pertaining to Commercial Warm Air Furnaces (gas heating units).
2. Casing

- a. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. In order to ensure a water and air tight seal, service panels shall have lifting handles and no more than three screws to remove. All exposed vertical panels and top covers in the indoor air section shall be insulated with a 1/2-inch, 1-pound density foil-faced, fire-resistant, permanent, odorless, glass fiber material. The base of the downflow unit shall be insulated with 1/2-inch, 1-pound density foil-faced, closed-cell material. The downflow unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8-inch high supply/return openings to provide an added water integrity precaution, if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting.
3. Compressors
 - a. All units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Internal overloads shall be provided with the scroll compressors. All models shall have crankcase heaters, phase monitors and low and high pressure control as standard. Dual compressors are available on all standard efficiency models and 12.5 to 20 tons high efficiency models and allow for efficient cooling utilizing 3 stages of compressor operation (high efficiency models only). 25 tons high efficiency units have 3 compressors for up to 4 stages of compressor operation.
4. Controls
 - a. Unit shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Unit shall provide an external location for mounting a fused disconnect device. ReliaTel controls shall be provided for all 24-volt control functions. The resident control algorithms shall make all heating, cooling, and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control
 - b. algorithm maintains accurate temperature control, minimizes drift from set point, and provides better building comfort. A centralized control shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.
5. Crankcase Heaters
 - a. These band heaters provide improved compressor reliability by warming the oil to prevent migration during off-cycles or low ambient conditions. These are standard on all Voyager models.
6. Defrost Controls
 - a. Adaptive demand defrost shall be provided to permit defrost wherever coil icing conditions begin to significantly reduce unit capacity.
7. Discharge Line Thermostat
 - a. A bi-metal element discharge line thermostat is installed as a standard option on the discharge line of each system. This standard option provides extra protection to the compressors against high discharge temperatures in case of loss of charge, extremely high ambient and other conditions which could drive the discharge temperature higher. Discharge line thermostat is wired in series
 - b. with high pressure control. When the discharge temperature rises above the protection limit, the bi-metal disc in the thermostat switches to the off position, opening the 24 Vac circuit. When the temperature on the discharge line cools down, the bi-metal disc closes the contactor circuit, providing power to the compressor. When the thermostat opens the fourth time, the ReliaTel control must be manually reset to resume operation on that stage.
8. Evaporator and Condenser Coils
 - a. Microchannel coils will be burst tested by the manufacturer. Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be standard on high efficiency models and microchannel shall be

standard on standard efficiency for evaporator coils. Microchannel condenser coils shall be standard on all units. Coils shall be leak tested to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 225 psig and pressure tested to 450 psig. Sloped condensate drain pans are standard.

9. Filters
 - a. MERV13 filters with filter removal tool shall be available.
10. Gas Heating Section
 - a. The heating section shall have a drum and tube heat exchanger design using corrosion resistant steel components. A forced combustion blower shall supply premixed fuel to a single burner ignited by a pilotless hot surface ignition system. In order to provide reliable operation, a negative pressure gas valve shall be used on standard furnaces and a pressure switch on furnaces with modulating heat that requires blower operation to initiate gas flow. On an initial call for heat, the combustion blower shall purge the heat exchanger 45 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat. Units shall be suitable for use with natural gas or propane (field installed kit) and shall also comply with California requirements for low NOx emissions. The 12½– 25 tons shall have two stage heating (Gas/Electric only).
11. Indoor Fan
 - a. Units above shall have belt driven, FC centrifugal fans with adjustable motor sheaves. Units with standard motors shall have an adjustable idler-arm assembly for quick-adjustment of fan belts and motor sheaves. All motors shall be thermally protected. Oversized motors shall be available for high static application. All indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT).
12. Outdoor Fans
 - a. The outdoor fan shall be direct-drive, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motor(s) shall be permanently lubricated and shall have builtin thermal overload protection.
13. Phase Monitor
 - a. The Phase Monitor is a three-phase line monitor module that protects against phase loss, phase reversal and phase unbalance. It is intended to protect compressors from reverse rotation. It has an operating input voltage range of 190–600 Vac, and LED indicators for ON and FAULT. There are no field adjustments and the module will automatically reset from a fault condition.
14. Refrigerant Circuits
 - a. Each refrigerant circuit shall have independent fixed orifice or thermostatic expansion devices, service pressure ports, and refrigerant line filter driers factory installed as standard. An area shall be provided for replacement suction line driers. Thermal Expansion Valves (TXVs) shall be standard on all high efficiency units.
15. Unit Top
 - a. The top cover shall be one piece, or where seams exist, double hemmed and gasket sealed to
 - b. Prevent water leakage.
16. Variable Frequency Drive
 - a. Variable Frequency Drives are factory installed and tested to provide supply fan motor speed modulation, as well as modulating gas heat. VFDs on the supply fan, as compared to inlet guide vanes or discharge dampers, are quieter, more efficient, and are eligible for utility rebates. All VFDs are designed to allow bypass if required.
 - b. **Note:** *It has to be hard wired with relay and removed for temporary operations; see wave 121927.* Bypass control will simply provide full nominal airflow in the event of drive failure. Modulating gas heat models with VFDs allow tighter space temperature control with less temperature swing.

B. Factory Installed Options

1. CompleteCoat™ Coils
 - a. Cathodic epoxy type electro-disposition coating formulated for high edge build to plate fin and tube heat exchangers
 - b. Coating provides excellent resistance and durability to corrosive effects of alkalies, acids, alcohols, petroleum, seawater, salt air and corrosive environments
 - c. Option is available for the plate fin-tube condenser coil and the microchannel type condenser
 - d. coil
 2. Condensate Overflow Switch
 - a. If a clogged condensate drain line is preventing proper condensate removal from the unit this option will shut the unit down
 3. Heat Exchanger
 - a. Compact cabinet features a tubular heat exchanger in low, medium and high heat capacities
 - b. Stainless steel burners and corrosion-resistant aluminized steel tubes standard on all models
 - c. Induced draft blower to pull the gas mixture through the burner tubes
 - d. Direct spark ignition system doubles as a safety device to validate the flame
 - e. Gas/electric Precedent™ models exceed all California seasonal efficiency requirements and perform better than required to meet the California NOx emission requirements
 4. Hinged Access Doors
 - a. Sheet metal hinges available on the filter/evaporator, supply fan/heat, and the compressor/ control access doors
 5. Powered or Unpowered Convenience Outlet
 - a. Powered or unpowered GFCI, 120V/15amp, 2 plug, convenience outlet
 - b. When convenience outlet is powered, a service receptacle disconnect will be available
 - c. Convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker
 - d. Available to order when through-the-base electrical with disconnect switch or circuit breaker option is ordered
 6. Multi-Speed Indoor Fan System
 - a. Automatically switch operation of the indoor fan between high speed and low speed, based on the number of compressors operating
 - b. Operate at high speed whenever the gas or electric heater is operating
 7. Supply, Return and Plenum Air Smoke Detector
 - a. All unit operation will shut down if smoke is detected
 - b. Reset manual at unit
 - c. In order for supply or return air smoke detector to properly sense smoke in the supply/return air stream, entering air velocity must be between 500 - 4000 feet per minute
 - d. Equipment covered in this manual will develop an airflow velocity that falls within these limits over the entire airflow range specified in the evaporator fan performance table
 - e. Supply and/or return smoke detectors may not be used with plenum smoke detector
 8. Through-the-Base Electrical Access
 - a. Electrical access for control and main power connections inside the curb and through-the base of the unit
 - b. Field installation of liquid-tight conduit
 - c. External field-installed disconnect switch
- C. Factory or Field Installed Options
1. Economizer (Standard)
 - a. Available with or without barometric relief.

- b. Fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and fixed dry bulb control
 - c. Barometric relief shall provide a pressure operated damper that shall be gravity closing
 - d. Barometric relief shall prohibit entrance of outside air during the equipment "off" cycle
 - e. Arrives in shipping position and shall be moved to the operating position by the installing contractor
- 2. Low Leak Economizer
 - a. Meets low leak requirements for ASHRAE 90.1, IECC, and CA Title 24 standards (3 cfm/ ft²@1" wg exterior air, 4 cfm/ft²@1" wg return air)
 - b. 100% outdoor air supply from 0-100% modulating dampers
 - c. Standard with barometric relief
 - d. Can be paired with powered exhaust for additional building pressure relief
 - e. Can be paired with or without Fault Detection & Diagnostics (FDD) to meet current mandatory CA Title 24 requirements
 - f. Available on downflow units only
- D. Field Installed Options
 - 1. Powered Exhaust
 - a. Available for 3 to 10 ton units
 - b. Shall provide exhaust of return air, when using an economizer
 - c. Maintain better building pressurization
 - 2. Roof Curb
 - a. Designed to mate with the unit's downflow supply and return
 - b. Provide support and a water tight installation when installed properly
 - c. Shall allow field-fabricated rectangular supply/return ductwork to be connected directly to the curb
 - d. Curb shall be shipped knocked down for field assembly
 - e. Shall include wood nailer strips

2.4 SCREENS

- A. Provide removable bird screens on all outside air intakes and exhaust air discharges to outside air. Screen shall be secured in frames of same materials as duct, hood or equivalent to which attached.
- B. Screens for louvers provided under other Divisions of the specifications are not included under this section.

2.5 CONTROLS

- A. See Requirements in Section 23 0900 for Controls.
- B. The Mechanical Contractor shall be responsible for the proper coordination of all control work and electrical work in connection therewith. Contractor shall also be responsible for the proper operation of the entire system.
- C. The Electrical Contractor shall furnish and install all line voltage control wiring, and all conduit. Wire sizing and length of run shall be coordinated with the manufacturer and Electrical Engineer. All EMS controls, wiring, and conduit shall be by EMS contractor.
- D. Electrical Work: All electric relays, hand-off automatic switches and all electrical wiring and all conduit will be provided under the Electrical Section, except as otherwise specified. Furnish and install additional conduit, wiring, relays, and hand-off-automatic switches made

necessary by the use of approved substituted equipment under this Section with no additional cost to the District.

- E. Refer to drawings for control diagrams and additional requirements.
- F. Calibration of Controls: The EMS Contractor shall carefully calibrate and adjust all controls as required to maintain comfort conditions and maximum energy conservation.
- G. EMS Thermostats shall be by the EMS contractor and shall part of an energy management system unless specified otherwise.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the District, if suitability is doubted. Contractor shall notify the District before installation into any apparent improper locations of interference with other work such as electrical outlets, windows, cabinetwork or other features.

3.2 INSPECTION

- A. Roof-top equipment: Install in accordance with manufacturer's instructions. Mount units on factory built roof-mounting frame providing watertight enclosure to protect ductwork and utility services, or on platforms. Install roof mounting frame level.
- B. All equipment shall be installed meeting strict conformance with manufacturer's recommendations. All equipment shall be installed level and plumb. Fan and motors shall be anchored-bolted to a concrete pad or suspended or wall mounted as shown on Contract Drawings. Only cast in place anchors shall be used for fan installation. Fans will be grounded as recommended by the manufacturer.
- C. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

3.3 INSTALLATION OF EQUIPMENT

- A. Install all equipment in the locations indicated on the approved shop drawings.
- B. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- C. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly and that all adjustments have been made.
- D. All mechanical equipment (fans, ductwork, piping, etc.) shall be isolated from the building structure by means of noise and vibration isolators. No rigid contact shall be allowed between pipes or ducts and building structures or support frames.
- E. The gaps between penetrating elements, ductwork, piping and the walls of the holes shall be filled on all sides with resilient material and sealed air tight on each wall with non-hardening sealant. Provide sheet metal and collar at all exposed ductwork penetrations. Duct collar shall cover the annular space around the duct with a minimum 1" overlap.

- F. Fabricate, with steel, special mounting brackets as required to clear other equipment, doors and to span for best structural support of mechanical.
- G. All duct connections to mechanical equipment shall be made with flexible connectors.
- H. Install equipment so that nameplates are easily visible.
- I. Where not otherwise indicated, equipment and material installation is published manufactures' recommendations. This requirement includes details, clearances and

3.4 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.5 FILTERS

- A. Do not operate air supply system unless filters are installed, including temporary pre-filters for use during construction. If not used, deliver the spare set to the District at the time of acceptance.
- B. Install new filters at final inspection concurrently with turn over to District.

3.6 AIR BALANCING

- A. Refer to Section 23 0593.

3.7 SOUND AND VIBRATION ISOLATION

- A. All vibrating equipment shall be sound isolated form the structure.
- B. The Contractor shall submit all necessary data for each vibration isolator, including static deflection and weight loading, for equipment in operation.
- C. All vibrating equipment shall be provided with flexible pipe connections. Submit for approval prior to installation.
- D. All roof top package units are to be installed on vibration isolation curbs.

3.8 CLEANING

- A. Completely cover motor and other moving machinery to protect from dirt and water during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.
- B. During the process of work, premises shall be kept reasonably free of all debris, cuttings and waste material resulting from work under this heading. All debris, rubbish, leftover material tools and equipment shall be removed from the site prior to final acceptance.
- C. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil

spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.

- D. Damaged factory applied finished shall be "touched up". "Touched up" shall be accomplished with preparation, prime and finish coats applied in strict accordance with manufactures recommendations.

END OF SECTION

08/27/18

SECTION 23 81 30

SPLIT SYSTEM AIR CONDITIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.4 CLOSEOUT SUBMITTALS

- A. Equipment Identification and Operation Instructions: Furnish the Owner with a hard bound brochure titled "Mechanical System" which shall contain the following information typed, indexed, tabbed and bound inside:
 - 1. An alphabetical list of all equipment excepting pipe and fittings: the manufacture; the catalog number; and the local distributing agent, including his address and telephone number.
 - 2. Manufacturer's instructions for all items requiring maintenance. This shall include, but not be limited to, all motor driven equipment, controls, pressure regulating devices, packaged equipment, etc. Where manufacturer's directions are not clear, are incomplete or do not exist, develop information necessary to service, clean, adjust, etc., all items. Delete all information in manufacturer's literature, which is not applicable. Identify all equipment in the manual. List the time intervals that all maintenance tasks should be performed.
 - 3. Submit three (3) copies of the brochure to the Architect for approval and furnish the Owner with at least two (2) corrected brochures.
 - 4. Provide for and fasten to each piece of equipment a permanent name plate fabricated of engraved laminated plastic, white between black laminations, indicating the identifying mark and the area or spaces served by the equipment.

1.5 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electrical Code (NEC).

- C. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
- D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. The outdoor unit will be factory charged for a length of 98.4 feet of refrigerant with R-410A refrigerant.
- F. A holding charge of dry nitrogen shall be provided in the evaporator.
- G. System efficiency for multi-split shall be up to 16.6 SEER and 9.0 HSPF.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendation.

1.7 WARRANTY

- A. The units shall have a manufacturer's warranty for parts other than the compressor for a period of five (5) years from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of Daikin AC (Americas) Inc. according to Daikin's Terms and Conditions and Warranty Policy then in effect.

PART 2 - PRODUCTS

2.1 Mini-SPLIT SYSTEM AIR CONDITIONER

A. GENERAL:

1. **SYSTEM DESCRIPTION:** The variable capacity, heat pump air conditioning system shall be a Daikin Inverter Driven series (heat/cool model) split system. The system shall consist of a slim duct evaporator model FDXS09LVJU exclusively matched to outdoor model RXS09LVJU, and FDXS12LVJU exclusively matched to outdoor model RXS12LVJU direct expansion (DX), Daikin rotary swing air-cooled, variable speed driven compressor using R-410A refrigerant. The outdoor unit is a horizontal discharge air variable speed condenser fan using a single phase power supply. The system shall have a self-diagnostic function, 3-minute time delay mechanism and have a factory pre-charge of R-410A adequate for 33 feet of total length. The system shall have automatic restart capability after a power failure has occurred and a low voltage cut-off feature to prevent stalling during power supply issues.

B. PERFORMANCE:

1. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below.

System Model (Indoor/Outdoor)	Cooling Capacity (min.~max.)	Heating Capacity (min.~max.)	Cooling Power (watts)	Heating Power (watts)	SEER	EER	HSPF
FDXS/RXS09LVJU	4,400~8,500	4,400 ~ 10,000	300~760	290~850	15.1	11.2	10.3
FDXS/RXS12LVJU	4,800~11,500	4,800 ~ 11,500	300~1,260	290~960	15.5	9.1	10.4

- a. The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping.
- b. The heating performance is based on 70°F DB / 60°F WB for the indoor unit and 47°F DB / 43°F WB for the outdoor unit and 25 feet of piping.
2. The operating range in cooling will be 50°F DB ~ 115°F DB, 14°F DB ~ 115°F DB when turning on switch B (SW4) on the PCB, and 0°F DB ~ 115°F DB when used with an optional wind baffle. The system will stop functioning below -0.4°F DB.
3. The operating range in heating will be 5°F DB ~ 77°F DB, and 0°F DB ~ 77°F DB when used with an optional wind baffle.
4. The system shall be capable of maximum refrigerant piping of 65 feet, with 49 feet maximum vertical difference, without any oil traps or additional equipment.

C. QUALITY ASSURANCE:

1. The units shall be listed by Electrical Laboratories (ETL), in accordance with UL-1995 certification and bear the cETL label.
2. All wiring shall be in accordance with the National Electrical Code (NEC).
3. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
5. The outdoor unit will be factory charged for a length of 33 feet of refrigerant with R-410A refrigerant.
6. A holding charge of dry nitrogen shall be provided in the evaporator.
7. System efficiency shall meet or exceed 15.1 SEER and 10.3 HSPF

D. INDOOR UNIT:

1. General: The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
2. Unit Cabinet:
 - a. The indoor unit shall have an unfinished sheet metal cabinet for concealed ducted applications.
 - b. The drain and refrigerant piping shall be accessible for flexible installation from the right side.
 - c. The cabinet shall be supplied with suspension bracket for securely mounting the cabinet to threaded rod (field supplied).
 - d. The cabinet includes a receiver to accept signals from an infra-red remote controller.
3. Fan:
 - a. The evaporator fan shall be an assembly consisting of a direct-driven sirocco fan by a single motor.
 - b. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
 - c. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings with an ESP of 0.12 in. WG at high speed for the rated capacity.
 - d. The return air shall be accessible by either bottom or rear return (standard).
4. Filter:

- a. The return air filter provided will be a mildew proof, removable and washable filter.
5. Coil:
 - a. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
 - b. All tube joints shall be brazed with silver alloy or phoscopper.
 - c. All coils will be factory pressure tested.
 - d. A condensate pan shall be provided under the coil with a drain connection.
6. Electrical:
 - a. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.
 - b. The allowable voltage range shall be 187 volts to 253 volts.
7. Control:
 - a. The unit shall have a receiver to accept wireless remote infra-red controller signals capable to operate the system. It shall have Automatic Operation, Dry Operation and Fan Only Operation.
 - b. The infrared remote controller shall consist of an On/Off Power switch, Mode Selector, Outdoor Quiet Operation (for outdoor unit), Fan Setting, On/Off Timer Setting, Temperature Adjustment, and Powerful Operation.
 - 1) On/Off switch power the system on or off mode.
 - 2) Mode selector shall operate the system in auto, cool, heat, fan or dry operation
 - 3) Outdoor unit quiet operation shall lower the sound level of the outdoor unit by slowing the inverter driven fan speed.
 - 4) Fan setting shall provide five fan speeds.
 - 5) On/Off timer is used for automatically switching the unit on or off.
 - 6) Temperature adjustment allows for the increase or decrease of the desired temperature.
 - 7) Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
 - c. The infrared remote control shall perform fault diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code.
 - d. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
 - e. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
8. Sound:
 - a. Indoor unit sound levels shall not exceed:

Indoor Daikin Model	Cooling Mode Sound Level (H/M/L) dB(A)	Heating Mode Sound Level (H/M/L) dB(A)
FDXS09LVJU	35 / 33 / 31	35 / 33 / 31
FDXS12LVJU	35 / 33 / 31	35 / 33 / 31

* values are measured approximately 3 feet away.

E. OUTDOOR UNIT:

1. General: The outdoor unit shall be specifically matched to the corresponding indoor unit size (e.g. FDXS09LVJU/RXS09LVJU). The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.
2. Unit Cabinet:

- a. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
3. Fan:
 - a. The fan shall be a direct drive, propeller type fan.
 - b. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
 - c. The fan shall be capable of operating in "outdoor unit quiet operation" which lowers the outdoor fan speed in either cool, heat or auto modes.
 - d. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
 - e. Airflow shall be horizontal discharge.
4. Coil:
 - a. The outdoor coil shall be nonferrous construction with corrugated fin tube.
 - b. Refrigerant flow from the condenser will be controlled via a metering device.
5. Compressor:
 - a. The compressor shall be a Daikin rotary swing inverter-driven compressor.
 - b. The outdoor unit shall have an accumulator, four-way reversing valve.
 - c. The compressor shall have an internal thermal overload.
 - d. The outdoor unit can operate with a maximum vertical height difference of 49 feet and overall maximum length of 66 feet without any oil traps, liquid or suction line changes.
6. Electrical:
 - a. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
 - b. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.
 - c. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the infrared remote controller.
 - d. Dedicated EEV's shall be provided for capacity control during part load of the indoor unit.
7. Sound:
 - a. Outdoor unit sound levels shall not exceed:

Outdoor Daikin Model	Cooling Mode Sound Level (H/L) dB(A)	Heating Mode Sound Level (H/L) dB(A)
RXS09LVJU	47/43	48/44
RXS12LVJU	49/44	49/45

* values are based on high fan speed and are measured approximately 3 feet away.

2.2 MULTI-SPLIT AIR CONDITIONING – Heat Pump

- A. System Description: The variable capacity, heat pump air conditioning system shall be a Daikin Inverter Driven series (heat/cool model) multi-split system. The system shall consist of two (2) evaporator models CTXS09HVJU and/or FDXS09DVJU exclusively matched to outdoor model 2MXS18GVJU direct expansion (DX), air-cooled, Daikin swing, variable speed, inverter driven compressor using R-410A refrigerant. The outdoor unit is a horizontal discharge, variable speed, single fan unit using a single phase power supply. The system shall have a self diagnostic function, 3-minute time delay mechanism and have a factory pre-charge of R-410A adequate for 98.4 feet of total length. The system shall have automatic restart capability after a power failure has occurred and a low voltage cut-off feature to prevent stalling during power supply issues. The system shall include a priority room setting for operation mode, powerful operation and quiet operation priority.
- B. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below.

System	Combined with	Nominal Cooling Capacity	EER	SEER	Nominal Heating Capacity	COP	Low Heating Capacity	COP	HSPF
		Btu/hr	95F		Btu/hr	47F	Btu/hr	17F	
2MXS18GVJU	Non Ducted Indoor Unit	18,000	12.6	19.5	22,000	3.40	13,500	2.70	9.2
	Ducted Indoor Unit	16,000	9.0	13.0	22,000	2.90	13,100	2.20	7.70
	Mixed Ducted and Non Ducted Indoor Unit	17,000	10.8	16.3	22,000	3.15	13,300	2.45	8.5

1. The operating range in cooling will be 14°F DB ~ 115°F DB.
 2. The operating range in heating will be 5°F DB ~ 72°F DB.
- C. The system shall be capable of maximum refrigerant piping of 164 feet (maximum 82 feet per indoor unit), with 49 feet maximum vertical difference, without any oil traps or additional components.
- D. **QUALITY ASSURANCE:**
1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
 2. All wiring shall be in accordance with the National Electrical Code (NEC).
 3. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
 4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
 5. The outdoor unit will be factory charged for a length of 98.4 feet of refrigerant with R-410A refrigerant.
 6. A holding charge of dry nitrogen shall be provided in the evaporator.
 7. System efficiency shall be up to 19.5 SEER and 9.2 HSPF.
- E. **Indoor Unit – CTXS:**
1. **General:** The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
 2. **Unit Cabinet:**
 - a. The indoor units shall have a white, "flat screen" finish.
 - b. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom).
 - c. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
 - d. The cabinet includes an "intelligent-eye" motion sensor capable of setting back the set point temperature for energy savings. This feature may be disengaged on the wireless remote controller.
 3. **Fan:**
 - a. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
 - b. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
 - c. An auto-swing louver for adjustable air flow (both vertically and horizontally) is standard via the wireless remote control furnished with each system.
 - d. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings.
 4. **Filter:**
 - a. The return air filter provided will be a mildew proof, removable and washable filter. Optional photo catalytic, air purifying filters are available.
 5. **Coil:**
 - a. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
 - b. All tube joints shall be brazed with silver alloy or phoscopper.

- c. All coils will be factory pressure tested.
- d. A condensate pan shall be provided under the coil with a drain connection.
- 6. Electrical:
 - a. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.
 - b. The allowable voltage range shall be 187 volts to 253 volts.
- 7. Control:
 - a. The unit shall have a backlit, wireless remote infra-red controller capable to operate the system. It shall have Cooling Operation, Heating Operation, Automatic Operation, Dry Operation and Fan Only Operation.
 - b. The controller shall consist of an On/Off Power switch, Mode Selector, Silent Button (for outdoor unit), Fan Setting, Swing Louver, On/Off Timer Setting, Temperature Adjustment, °C or °F Temperature Display, "Intelligent Eye" sensor, Home Leave Operation and Powerful Operation.
 - 1) On/Off switch powers the system on or off.
 - 2) Mode selector shall operate the system in auto, cool, heat, fan or dry operation
 - 3) Silent operation shall lower the sound level of the outdoor unit by slowing the inverter driven fan speed.
 - 4) Fan setting shall provide five fan speeds, plus quiet and auto settings.
 - 5) Swing louver shall adjust the airflow (horizontal and vertical) blades.
 - 6) On/Off timer is used for automatically switching the unit on or off.
 - 7) Temperature adjustment allows for the increase or decrease of the desired temperature.
 - 8) Intelligent eye provides an infrared sensor which detects movement and adjusts the temperature by 3.6°F up or down depending on operating mode.
 - 9) Home leave operation allows you to record your favorite temperature and airflow setting and allows the system to set back to a user defined setting.
 - 10) Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
 - c. The remote control shall perform Fault Diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code.
 - d. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
 - e. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
- 8. Sound:
 - a. Indoor unit sound levels shall not exceed:

Indoor Daikin Model	Cooling Mode Sound Level (H/M/L) dB(A)	Heating Mode Sound Level (H/M/L) dB(A)
CTXS09HVJU	44 / 40 / 35	44 / 39 / 34

*values are measured approximately 3 feet away.

F. Outdoor Unit:

- 1. General: The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.
- 2. Unit Cabinet:
 - a. The cabinet shall be ivory white with a finished powder coated backed enamel paint.
- 3. Fan:
 - a. The fan shall be a direct drive, propeller type fan.

- b. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
- c. The fan shall be capable of operating in “silent operation” which lowers the outdoor fan speed in either cool, heat or auto modes.
- d. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
- e. Airflow shall be horizontal discharge.
- 4. Coil:
 - a. The outdoor coil shall be nonferrous construction with corrugated fin tube.
 - b. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
 - c. Refrigerant flow from the condenser will be controlled via a metering device.
- 5. Compressor:
 - a. The compressor shall be a Daikin swing inverter-driven compressor.
 - b. The outdoor unit shall have an accumulator, four-way reversing valve.
 - c. The compressor shall have an internal thermal overload.
 - d. The outdoor unit can operate with a maximum vertical height difference of 49 feet and overall maximum length of 164 feet (or 82 feet for one room) without any oil traps or additional components.
- 6. Electrical:
 - a. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
 - b. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.
 - c. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the infrared remote controller.
 - d. Dedicated EEV's shall be provided for capacity control during part load of each connected indoor unit.
- 7. Sound:
 - a. Outdoor unit sound levels shall not exceed:

Outdoor Daikin Model	Cooling Mode Sound Level dB(A)	Heating Mode Sound Level dB(A)
2MXS18GVJU	50	51

* values are based on high fan speed and are measured approximately 3 feet away.

2.3 MULTI-SPLIT AIR CONDITIONING – Heat Pump

- A. System Description: The variable capacity, heat pump air conditioning system shall be a Daikin Inverter Driven series (heat/cool model) multi-split system. The system shall consist of combinations of two (2) or three (3) evaporator models CDXS15LVJU, CDXS18LVJU, CTXS07LVJU, CTXS09HVJU, CTXS12HVJU, FDXS09LVJU, FDXS12LVJU, FTXS15LVJU and FTXS18LVJU exclusively matched to outdoor model 3MXS24JVJU direct expansion (DX), air-cooled, Daikin swing, variable speed, inverter driven compressor using R-410A refrigerant. The outdoor unit is a horizontal discharge, variable speed, single fan unit using a single phase power supply. The system shall have a self-diagnostic function, 3-minute time delay mechanism and have a factory pre-charge of R-410A adequate for 131.6 feet of total length. The system shall have automatic restart capability after a power failure has occurred and a low voltage cut-off feature to prevent stalling during power supply issues. The system shall include a priority room setting for operation mode, powerful operation and quiet operation priority.
- B. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance tables below.

Certified Performance Ratings									
AHRI Number	Brand	Outdoor Model	Indoor Model	Capacity 95 °F High	EER 95°F	SEER	High Heat 47 °F	HSPF	Low Heat 17 °F
3699491	DAIKIN	3MXS24JVJU	Ducted Indoor Units	23400	9.7	13	29000	7.7	18100
3697115	DAIKIN	3MXS24JVJU	Non-Ducted Units	24000	12.5	16.6	30000	9	19300
3759750	DAIKIN	3MXS24JVJU	Mixed Ducted and Non-Ducted	23600	11.1	14.8	29400	8.35	18600

- a. The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping.
 - b. The heating performance is based on 70°F DB / 60°F WB for the indoor unit and 47°F DB / 43°F WB for the outdoor unit and 25 feet of piping.
- C. The operating range in cooling will be 14°F DB ~ 115°F DB.
- D. The operating range in heating will be 5°F DB ~ 72°F DB.
- E. The system shall be capable of maximum refrigerant piping of 230 feet (maximum 82 feet per indoor unit), with 49 feet maximum vertical difference, without any oil traps or additional components.
- F. QUALITY ASSURANCE:
1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
 2. All wiring shall be in accordance with the National Electrical Code (NEC).
 3. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
 4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
 5. The outdoor unit will be factory charged for a length of 131.6 feet of refrigerant with R-410A refrigerant.
 6. A holding charge of dry nitrogen shall be provided in the evaporator.
 7. System efficiency shall be up to 16.6 SEER and 9.0 HSPF.
- G. Indoor Units – FTXS / CTXS:
1. General: The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
 2. Unit Cabinet:
 - a. The indoor units shall have a white, "flat screen" finish.
 - b. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom).
 - c. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
 - d. The cabinet includes an "intelligent-eye" motion sensor capable of setting back the set point temperature for energy savings. This feature may be disengaged on the wireless remote controller.
 3. Fan:
 - a. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
 - b. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
 - c. An auto-swing louver for adjustable air flow (both vertically and horizontally) is standard via the wireless remote control furnished with each system.
 - d. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings.
 4. Filter:

- a. The return air filter provided will be a mildew proof, removable and washable filter. Optional photocatalytic, air purifying filters are available.
5. Coil:
 - a. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
 - b. All tube joints shall be brazed with silver alloy or phoscopper.
 - c. All coils will be factory pressure tested.
 - d. A condensate pan shall be provided under the coil with a drain connection.
6. Electrical:
 - a. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.
 - b. The allowable voltage range shall be 187 volts to 253 volts.
7. Control:
 - a. The unit shall have a backlit, wireless remote infra-red controller capable to operate the system. It shall have Cooling Operation, Heating Operation, Automatic Operation, Dry Operation and Fan Only Operation.
 - b. The controller shall consist of an On/Off Power switch, Mode Selector, Silent Button (for outdoor unit), Fan Setting, On/Off Timer Setting, Temperature Adjustment, °C or °F Temperature Display, "Intelligent Eye" sensor, Home Leave Operation (CTXS_HVJU) and Powerful Operation.
 - 1) On/Off switch powers the system on or off.
 - 2) Mode selector shall operate the system in auto, cool, heat, fan or dry operation
 - 3) Silent operation shall lower the sound level of the outdoor unit by slowing the inverter driven fan speed.
 - 4) Fan setting shall provide five fan speeds, plus quiet and auto settings.
 - 5) Swing louver shall adjust the airflow (horizontal and vertical) blades.
 - 6) On/Off timer is used for automatically switching the unit on or off.
 - 7) Temperature adjustment allows for the increase or decrease of the desired temperature.
 - 8) Intelligent eye provides an infrared sensor which detects movement and adjusts the temperature by 3.6°F up or down depending on operating mode.
 - 9) Home leave operation (CTXS_HVJU) allows you to record your favorite temperature and airflow setting and allows the system to set back to a user defined setting.
 - 10) Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
 - c. The remote control shall perform Fault Diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code.
 - d. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
 - e. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
8. Sound:
 - a. Indoor unit sound levels shall not exceed:

Indoor Daikin Model	Cooling Mode Sound Level (H/M/L) dB(A)	Heating Mode Sound Level (H/M/L) dB(A)
CTXS07LVJU	38 / 32 / 25	38 / 28 25
CTXS09HVJU	44 / 40 / 35	44 / 39 / 34
CTXS12HVJU	45 / 41 / 36	45 / 40 / 35

FTXS15LVJU	45 / 40 / 35	43 / 38 / 33
FTXS18LVJU	46 / 41 / 36	45 / 40 / 35

*values are measured approximately 3 feet away.

H. Outdoor Unit:

1. General: The outdoor unit shall be specifically matched to the corresponding indoor unit combinations. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.
2. Unit Cabinet:
 - a. The cabinet shall be ivory white with a finished powder coated backed enamel paint.
3. Fan:
 - a. The fan shall be a direct drive, propeller type fan.
 - b. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
 - c. The fan shall be capable of operating in "silent operation" which lowers the outdoor fan speed in either cool, heat or auto modes.
 - d. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
 - e. Airflow shall be horizontal discharge.
4. Coil:
 - a. The outdoor coil shall be nonferrous construction with corrugated fin tube.
 - b. Refrigerant flow from the condenser will be controlled via a metering device.
5. Compressor:
 - a. The compressor shall be a Daikin swing inverter-driven compressor.
 - b. The outdoor unit shall have an accumulator, four-way reversing valve.
 - c. The compressor shall have an internal thermal overload.
 - d. The outdoor unit can operate with a maximum vertical height difference of 49 feet and overall maximum length of 230 feet (or 82 feet for one room) without any oil traps or additional components.
6. Electrical:
 - a. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
 - b. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.
 - c. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the infrared remote controller.
 - d. Dedicated EEV's shall be provided for capacity control during part load of each connected indoor unit.
7. Sound:
 - a. Outdoor unit sound levels shall not exceed:

Outdoor Daikin Model	Cooling Mode Sound Level dB(A)	Heating Mode Sound Level dB(A)
3MXS24JVJU	52	54

*values are based on high fan speed and are measured approximately 3 feet away.

2.4 MULTI-SPLIT AIR CONDITIONING – SKY Air

A. QUALITY ASSURANCE:

1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.

2. All wiring shall be in accordance with the National Electrical Code (NEC).
3. The system shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
5. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2002 and installed to resist the wind pressures on the equipment and the supports.
6. The outdoor unit will be factory charged with R-410A.
7. A holding charge of dry nitrogen shall be provided in the evaporator.
8. System efficiency shall meet or exceed 16.0 SEER and 9.2 HSPF.

B. OUTDOOR UNIT:

1. General: The outdoor condensing unit is designed specifically for use with matched capacity (e.g. RZQ24PVJU9/FAQ24PVJU) SkyAir series indoor evaporator units.
 - a. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of a Daikin swing compressor, motors, fan, condenser coil, electronic expansion valves, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut off valves, service ports and suction accumulator.
 - b. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
 - c. The outdoor unit can be wired and piped with outdoor unit access from the left, right, front or rear.
 - d. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit.
 - e. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.
 - f. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
 - g. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
 - h. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
 - i. The outdoor unit shall be capable of cooling & heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
2. Unit Cabinet:
 - a. The outdoor unit model RZQ__PVJU9 shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
3. Fan:
 - a. The condensing unit shall consist of one propeller type, direct-drive 70 W fan motor that has multiple speed operation via a DC (digitally commutating) inverter.

Model Number	Fan Motor Output (W) & Quantity
RZQ18PVJU9	70 x 1
RZQ24PVJU9	70 x 1

- b. The fan shall be a horizontal discharge configuration with a nominal airflow maximum of 1,835 cfm.

- c. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
 - d. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
 - e. The outdoor unit shall be capable of operating at further reduced sound levels during night time.
4. Condenser Coil:
- a. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
 - b. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure highly efficient performance.
 - c. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
 - d. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
 - e. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
5. Compressor:
- a. The Daikin swing compressor shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity shall be controlled to eliminate deviation from target value.
 - b. The inverter driven compressor shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed swing "F-type" type.
 - c. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
 - d. The capacity control range shall be as shown below:

Model Number	Capacity Control Range
RZQ18PVJU9	35-100%
RZQ24PVJU9	30-100%

- e.
 - f. The compressor shall be equipped with a crankcase heater, high pressure safety switch and internal thermal overload protector.
 - g. The compressor shall be mounted to avoid the transmission of vibration.
6. Electrical:
- a. The power supply to the outdoor unit shall be 208-230 volts, 1 phase, 60 hertz +/- 10%.

Power Supply Voltage	Voltage Range
208-230V/1/60	187V-253V

Model	MCA	MOP

RZQ18PVJU9	16.5	20
RZQ24PVJU9	16.5	20

- b. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded, stranded 2 conductor cable.
- c. The control wiring shall be a two-wire multiplex transmission system, thus simplifying the wiring operation.
- d. The control wiring lengths shall be as shown below:

	Outdoor to Indoor Unit	Outdoor to Central Controller	Indoor Unit to Remote Control
Control Wiring Length	6,665	3,330	1,665
Wire Type	18 AWG, 2 wire, non-polarity, non-shielded, stranded		

C. FBQ Indoor Unit – Ceiling Concealed Ducted Unit (Med. Static):

1. General: Daikin indoor unit model FBQ shall be a wall mounted fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. It shall be available in capacities from 18,000 Btu/h to 30,000 Btu/h. Model numbers are FBQ18PVJU, FBQ24PVJU, and FBQ30PVJU to be connected to the corresponding SkyAir series outdoor condensing unit model RZQ18PVJU9, RZQ24PVJU9, and RZQ30PVJU. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with Daikin BRC1E71 programmable controller, BRC2A71 simplified controller or optional wireless controller. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening. The indoor units sound pressure shall range from 37 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.

D. PERFORMANCE

1. Performance: Each unit's performance is based on nominal operating conditions:

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
FBQ18PVJU	18,000	20,000
FBQ24PVJU	24,000	27,000
FBQ30PVJU	30,000	34,000

2. Indoor Unit:
 - a. The Daikin indoor unit FBQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
 - b. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 - c. Both refrigerant lines shall be individually insulated from the outdoor unit.
 - d. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet.
 - e. The indoor units shall be equipped with a return air thermistor.
 - f. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 - g. The voltage range will be 253 volts maximum and 187 volts minimum.
3. Unit Cabinet:
 - a. The cabinet shall be located into the ceiling and ducted to the supply and return air openings.
 - b. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
4. Fan:
 - a. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
 - b. The unit shall be equipment with an automatically adjusting external static pressure logic selectable during commissioning.
 - c. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.47 HP.
 - d. The airflow rate shall be available in three settings.
 - e. The fan motor shall be thermally protected.
 - f. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
 - g. Fan motor external static pressure range for nominal airflow:

Model Number	Fan ESP (in. WG)
FBQ18PVJU	0.80 – 0.20

5. Coil:
 - a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 - b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 - c. The coil shall be a 3 row cross fin copper evaporator coil with 15 fpi design completely factory tested.
 - d. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
 - e. A condensate pan shall be located under the coil.
 - f. A condensate pump with a 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
 - g. A thermistor will be located on the liquid and gas line.
6. Electrical:
 - a. A separate power supply will be required of 208-230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 - b. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).

- c. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- 7. Control:
 - a. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 - b. A full array of fault diagnostics shall be accessible via the wired remote controller.
- E. Optional Accessories Available:
 - 1. Remote "in-room" sensor kit KRCS01-4B (recommended).
 - a. The Daikin wall mounted, hard wired remote sensor kit is recommended for applications where there could be a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).
 - 2. MERV 13 Filter Kit.
 - 3. Navigation Remote Controller (BRC1E71).
 - 4. Simplified Wired Controller (BRC2A71).

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the Owner, if suitability is doubted. Contractor shall notify the Owner before installation into any apparent improper locations of interference with other work such as electrical outlets, windows, cabinetwork or other features.

3.2 INSPECTION

- A. All equipment shall be installed meeting strict conformance with manufacturer's recommendations. All equipment shall be installed level and plumb. Fans will be grounded as recommended by the manufacturer.
- B. Verify that the mechanical system may be installed in complete accordance with all pertinent codes and regulations and the approved shop drawings.

3.3 INSTALLATION OF EQUIPMENT

- A. The system must be installed by a Daikin factory trained contractor/dealer.
- B. Install all equipment in the locations indicated on the approved shop drawings.
- C. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing all doors and passageways.
- D. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly and that all adjustments have been made.
- E. All mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators.
- F. Install equipment so that nameplates are easily visible.

- G. Where not otherwise indicated, equipment and material installation is published manufactures' recommendations. This requirement includes details, clearances and accessories.

3.4 CUTTING, PATCHING AND DAMAGE

- A. All necessary cutting and patching of walls, floors, partitions, ceilings, etc., as required for the proper installation of work under this section shall be done under this section. No cutting of structural members will be permitted without the written permission of the Architect.

3.5 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.6 REFRIGERANT PIPING

- A. Install piping to conserve building space and not to interfere with use of space. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient. Wherever practical, group piping at common elevations and locations. Slope piping one percent in direction of refrigerant return.
- B. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches

3.7 CLEANING

- A. Completely cover motor and other moving machinery to protect from dirt during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.
- B. During the process of work, premises shall be kept reasonably free of all debris, cuttings and waste material resulting from work under this heading. All debris, rubbish, leftover material tools and equipment shall be removed from the site prior to final acceptance.
- C. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.
- D. Damaged factory applied finished shall be "touched up". "Touched up" shall be accomplished with preparation, prime and finish coats applied in strict accordance with manufactures recommendations.

END OF SECTION

08/27/18

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Electrical identification.
 - 2. Utility company electricity-metering components.
 - 3. Concrete equipment bases.
 - 4. Electrical demolition.
 - 5. Cutting and patching for electrical construction.
- B. Refer to drawings for applicable codes.
- C. Refer to Division 11 specifications for additional electrical work to be provided.
- D. Refer to FS drawings for additional electrical work to be provided.

1.2 SUBMITTALS

- A. Product Data: For utility company electricity-metering components.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts and single-line diagram of electricity-metering component assemblies specific to this Project.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Devices for Utility Company Electricity Metering: Comply with utility company published standards.
- C. Comply with NFPA 70.

1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for service entrances and electricity-metering components.

- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.
- D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.
 - 1. Materials: Same as channels and angles, except metal items may be stainless steel.
- E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- H. Expansion Anchors: Carbon-steel wedge or sleeve type.
- I. Toggle Bolts: All-steel springhead type.
- J. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.

2. Embedded continuous metallic strip or core.
 3. Printed legend that indicates type of underground line.
- F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.
1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
 2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch, galvanized-steel backing. 1/4-inch grommets in corners for mounting.
- H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A. Comply with requirements of electrical power utility company for all new service entrance equipment, raceways and structures.

2.4 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.

- B. Dry Locations: Steel materials.
- C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

3.3 SUPPORT INSTALLATION

- A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.
- C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:
 - 1. Wood: Wood screws or screw-type nails.
 - 2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.
 - 3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
 - 4. New Concrete: Concrete inserts with machine screws and bolts.
 - 5. Existing Concrete: Expansion bolts.
 - 6. Structural Steel: Spring-tension clamps.
 - a. Comply with AWS D1.1 for field welding.
 - 7. Light Steel Framing: Sheet metal screws.
 - 8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
 - 9. Light Steel: Sheet-metal screws.
 - 10. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power

and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

- F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- G. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.5 ELECTRICITY-METERING EQUIPMENT

- A. Install utility company metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.6 FIRESTOPPING

- A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Division 7 Section "Penetration Firestopping."

3.7 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.8 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.9 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION

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SECTION 26 05 13

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THW, THHN-THWN or XHHW complying with NEMA WC 5 or 7

2.3 CONNECTORS AND SPLICES

- A. Manufacturers:

1. AFC Cable Systems, Inc.
 2. AMP Incorporated/Tyco International.
 3. Hubbell/Anderson.
 4. O-Z/Gedney; EGS Electrical Group LLC.
 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Fire Alarm Circuits: Type THHN-THWN, in raceway.
- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Penetration Firestopping."
- G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

09/21/18

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.2 SUBMITTALS

- A. Product Data: For ground rods.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Boggs, Inc.
 - 2. Copperweld Corp.
 - 3. Dossert Corp.
 - 4. Erico Inc.; Electrical Products Group.
 - 5. Galvan Industries, Inc.
 - 6. Harger Lightning Protection, Inc.
 - 7. Hastings Fiber Glass Products, Inc.
 - 8. Heary Brothers Lightning Protection Co.
 - 9. ILSCO.
 - 10. Kearney/Cooper Power Systems.
 - 11. Korns, C. C. Co.; Division of Robroy Industries.
 - 12. Lightning Master Corp.
 - 13. Lyncole XIT Grounding.
 - 14. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - 15. Robbins Lightning, Inc.

16. Salisbury, W. H. & Co.
17. Superior Grounding Systems, Inc.
18. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
 1. Size: 3/4 inch in diameter by 120 inches in length.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the indicated height above the floor.
- E. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.
- F. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
1. Install insulated equipment grounding conductors in feeders.
 2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
 3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
 4. Air-Duct Equipment Circuits: Install an insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
 5. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install an insulated equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
 6. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
 7. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing an insulated equipment grounding conductor with supply branch-circuit conductors.
- G. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.

- H. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- I. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- J. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- K. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- L. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- M. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - 6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
 - 7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
 - 8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
 - 9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

10. **Compression-Type Connections:** Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
 11. **Moisture Protection:** If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- N. **Manholes and Handholes:** Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- O. **Connections to Manhole Components:** Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.
- 3.2 **FIELD QUALITY CONTROL**
- A. **Testing:** Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
 - e. Manhole Grounds: 10 ohms.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alfalex Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.

- D. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- E. FMC: Aluminum.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corp.
 - 4. Cantex Inc.
 - 5. Certainteed Corp.; Pipe & Plastics Group.
 - 6. Condux International.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; Division of Hubbell, Inc.
 - 12. Spiralduct, Inc./AFC Cable Systems, Inc.
 - 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
 - 1. Manufacturers:
 - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
 - b. Thomas & Betts Corporation.
 - c. Walker Systems, Inc.; Wiremold Company (The).
 - d. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.

1. Manufacturers:
 - a. Butler Manufacturing Co.; Walker Division.
 - b. Enduro Composite Systems.
 - c. Hubbell, Inc.; Wiring Device Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.
 - C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.
- 2.5 BOXES, ENCLOSURES, AND CABINETS
- A. Manufacturers:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. Emerson/General Signal; Appleton Electric Company.
 3. Erickson Electrical Equipment Co.
 4. Hoffman.
 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 6. O-Z/Gedney; Unit of General Signal.
 7. RACO; Division of Hubbell, Inc.
 8. Robroy Industries, Inc.; Enclosure Division.
 - B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
 - C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
 - D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
 - E. Floor Boxes: Cast metal, fully adjustable, rectangular.
 - F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
 - G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
 - H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

2.7 CABLE TRAY

- A. Cable tray shall be aluminum, rung type, 24"W x 4"H, with rung spacing of 6", per NEMA VE 1 requirements.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Concealed: Rigid steel or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
 - 1. Exposed: EMT.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Conduits used for fiber optic cable installation shall be provided with inner duct.
- E. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Provide inner duct in conduit for all fiber optic cable installation.
- G. Provide flexible metal conduits for conduits installed inside cabinets.
- H. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- J. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- K. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- L. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- M. Tighten set screws of threadless fittings with suitable tools.
- N. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are

used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- P. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- Q. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- R. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- S. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- T. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- U. Set floor boxes level and flush with finished floor surface.
- V. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- W. Install cable tray in accordance with NEMA VE 2 requirements.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

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SEISMIC CONTROLS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes seismic restraints and other earthquake-damage-reduction measures for electrical components. It applies to and complements optional seismic-restraint requirements in the various electrical component Sections of these Specifications.

1.2 DEFINITIONS

- A. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.
- B. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independently of other structural elements during an earthquake.

1.3 SUBMITTALS

- A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic-restraint component used. Include documentation of evaluation and approval of components by agencies acceptable to authorities having jurisdiction.
- B. Shop Drawings: For components, physical arrangements, and installation details not defined by Drawings. Indicate materials and show calculations, design analysis, details, and layouts, signed and sealed by a professional engineer.
- C. Pre-approval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints.
- D. Qualification data.
- E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in California Building Code, unless requirements in this Section are more stringent.
- B. Testing Agency Qualifications: An independent testing and inspection agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the inspection indicated.

1.5 PROJECT CONDITIONS

- A. Structural Design Criteria: As indicated on Structural Drawings.

1.6 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structure, architectural features, and mechanical, fire-protection, electrical, and other building systems.
- B. Coordinate concrete bases with building structural system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
 2. B-Line Systems, Inc.
 3. Erico, Inc.
 4. GS Metals Corp.
 5. Loos & Company, Inc.
 6. Mason Industries, Inc.,
 7. Powerstrut.
 8. Thomas & Betts Corp.
 9. Unistrut Corporation.

2.2 MATERIALS

- A. Use the following materials for restraints:
1. Indoor Dry Locations: Steel, zinc plated.
 2. Outdoors and Damp Locations: Galvanized steel.
 3. Corrosive Locations: Stainless steel.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

- A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Strength in tension and shear of components shall be at least twice the maximum seismic forces for which they are required to be designed.
- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC-BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch- thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
 - 1. Materials for Channel: ASTM A 570, GR 33.
 - 2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.
 - 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
 - 4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Hanger Rod Stiffeners: Slotted steel channels, installed vertically, with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.
- B. Install structural attachments as follows:
 - 1. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.
 - 2. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.
 - 3. Attachments to Existing Concrete: Use expansion anchors.
 - 4. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.
 - 5. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.
 - 6. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.
 - 7. Attachments to Wood Structural Members: Install bolts through members.
 - 8. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.
- C. Install electrical equipment anchorage as follows:
 - 1. Anchor panelboards, motor-control centers, motor controls, switchboards, transformers, fused power-circuit devices, control, and distribution units as follows:
 - a. Anchor equipment rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.
 - b. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

- c. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.
 - d. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.
 - e. Torque bolts and nuts on studs to values recommended by equipment manufacturer.
- D. Install seismic bracing as follows:
 - 1. Install bracing according to spacings and strengths indicated by approved analysis.
 - 2. Expansion and Contraction: Install to allow for thermal movement of braced components.
 - 3. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.
- E. Accommodation of Differential Seismic Motion: Make flexible connections in raceways, cables, wireway, cable trays, and busway where they cross expansion- and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.
- B. Testing Agency: Engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.
- C. Reinspection: Correct deficiencies and verify by reinspection that work complies with requirements.
- D. Provide written report of tests and inspections.

END OF SECTION

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Not used:

3.3 PROJECT CONDITIONS

- A. Project Seismic Zone and Zone Factor as Defined in UBC: Zone 3, Zone Factor 0.30.
- B. Occupancy Category as Defined in UBC: III
- C. Acceleration Factor as Defined in UBC, BOCA, or SBC: 0.75 G

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification of electrical equipment and devices for all renovation and new building projects.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for Identification of materials and method.
- C. Samples: One for each type of materials specified.

1.3 QUALITY ASSURANCE

- A. All identification material and methods, engraved labels, conductor numbers, branch circuit schedules, relay panel schedules, identification for circuit breakers and underground utility markers shall meet Code requirements and industry standards.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For Engraved Labels: Lamicoid
- B. For Conductor Numbers: Brady
- C. For Underground Utilities Ribbon: Allen Systems, Inc.

2.2 IDENTIFICATION MATERIALS AND METHODS

- A. Coordinate names, abbreviations and other designations with equipment specified in this or other Divisions of the Specification or identified by the District.
- B. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs including warning labeling and identification on existing equipment.
- C. Furnish products listed by UL or other testing firm acceptable to AHJ.

2.3 ENGRAVED LABELS

- A. Melamine plastic laminate, white with black core, 1/16-inch thick.
- B. Dymo tape labels are not acceptable.

2.4 CONDUCTOR NUMBERS

- A. Manufacturers standard vinyl-cloth self-adhesive cable and conductor markers of the wraparound type. Preprinted black numbers on yellow field.

2.5 BRANCH CIRCUIT SCHEDULES

- A. Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.
- B. Provide two columns, odd numbers in left column, even numbers in right column, with 3-inch-wide line for typing connected load information.

2.6 RELAY PANEL SCHEDULES

- A. Provide typewritten schedule to identify the incoming circuit, the controlled load, and the controlling devices for each relay.

2.7 IDENTIFICATION FOR CIRCUIT NUMBERS:

- A. Provide permanent identification number in or on panelboard dead-front adjacent to each circuit breaker pole position. Square D adhesive is approved, other adhesives by specific prior approval only.
- B. Horizontal centerline of engraved numbers to correspond with centerline of circuit breaker pole position.
- C. Detectable plastic ribbon, 6-inch wide by 4 mil thick.

2.8 UNDERGROUND UTILITY MARKERS

- A. Color code as recommended by APWA. Safety Red for electric power distribution. Safety Alert Orange for telephone, signal, data and cable TV.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten labels to equipment in a secure and permanent manner.
- B. Mark underground utilities in conformance with APWA.
- C. Where signs are to be applied to surfaces which require finish, install identification after completion of painting.
- D. Engravers standard letter style, minimum 3/16-inch high capital letters.
- E. Drill or punch labels for mechanical fastening except where adhesive mounting is necessary because of substrate. Use self tapping stainless steel screws.
- F. Install an engraved label on each major unit of electrical equipment indicating both equipment name and circuit serving equipment (e.g. "EF-1, CKT. 2P1-1,3,5), including but not limited to the following items:
 - 1. Disconnect switches, identify item of equipment controlled.
 - 2. Relays.
 - 3. Contactors.
 - 4. Time switches.
 - 5. Override switches.
 - 6. Service disconnect and distribution switches, identify connected load.

7. Branch circuit panelboards.
 8. Central or master unit of each electrical system including communication/signal systems, unless the unit incorporates its own self-explanatory identification.
- G. Install engraved on the inside of flush panels, visible when door is opened. Install label on outside of surface panel.
- H. Apply markers on each conductor for power, control, signaling and communications circuits where wires of more than one circuit are present.
- I. Match conductor identification used in panelboards, shop drawings, contract documents and similar previously established identification for division 26 work.
- J. Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.
- K. Provide two columns, odd numbers in left column, even numbers in right column, with 3-inch-wide line for typing connected load information.
- L. Provide typewritten schedule to identify the incoming circuit, the controlled load, and the controlling devices for each relay.
1. Imprint over entire length of ribbon in permanent black letters, the system description, selected from manufacturer's standard legend which most accurately identifies the subgrade system.
 2. Install continuous tape, 6 to 8 inches below finish grade, for each exterior underground raceway.
 3. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16 inches, install a single marker. Over 16 inch width of lines, install multiple tapes not over 10 inches apart (edge to edge) over the entire group of lines.

END OF SECTION

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SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Time switches.
 - 2. Photoelectric relays.
 - 3. Occupancy sensors.
 - 4. Multipole lighting relays.
 - 5. Multipole lighting contactors.
 - 6. Basic control contactor panels
 - 7. System clock
 - 8. Exterior photocell

1.2 SUBMITTALS

- A. Product Data: For each type of lighting control device indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.
- D. Shop drawings: Submit dimensional drawings of all lighting control system components and accessories.
- E. Typical wiring diagram: Submit typical wiring diagrams for all components including, but not limited to, contactor panels, contactors, photocells, switches, occupancy sensors, and daylighting controls.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Contactors and Relays:

- a. Automatic Switch Co.
 - b. Challenger Electrical Equipment Corp.
 - c. Cutler-Hammer Products; Eaton Corporation.
 - d. Furnas Electric Co.
 - e. GE Lighting Controls.
 - f. Hubbell Lighting, Inc.
 - g. Siemens Energy and Automation, Inc.
 - h. Square D Co.; Power Management Organization.
 - i. Zenith Controls, Inc.
2. Time Switches:
- a. Diversified Electronics, Inc.
 - b. Grasslin Controls Corp.
 - c. Intermatic, Inc.
 - d. Leviton Manufacturing.
 - e. Paragon Electric Co., Inc.
 - f. Tork, Inc.
 - g. Zenith Controls, Inc.
 - h. Watt Stopper, Inc. (The).
3. Photoelectric Relays:
- a. Allen-Bradley/Rockwell Automation.
 - b. Area Lighting Research, Inc.
 - c. Fisher Pierce.
 - d. Grasslin Controls, Corp.
 - e. Intermatic, Inc.
 - f. Paragon Electric Co., Inc.
 - g. Rhodes, M H , Inc.
 - h. SSAC, Inc.
 - i. Tork, Inc.
4. Occupancy Sensors:
- a. Watt Stopper, Inc. (The).
 - b. Honeywell, Inc.; Home and Building Controls.
 - c. Hubbell Lighting, Inc.

- d. Lightolier.
 - e. Lithonia Control Systems.
 - f. MyTech Corporation.
 - g. Novitas, Inc.
 - h. RAB Electric Manufacturing Co., Inc.
5. Basic control contactor panels and associated accessories:
- a. Watt Stopper, Inc. (The).
 - b. Lithonia control systems
 - c. Leviton company Inc.
 - d. GE Industrial Systems; Total Lighting Control.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

- A. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

2.3 TIME SWITCHES

- A. Description: Solid-state programmable type with alphanumeric display complying with UL 917.
 - 1. Astronomic dial.
 - 2. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.
 - 3. Two pilot-duty contacts, rated 2 A at 240-V ac, unless otherwise indicated.
 - 4. Eight-day program uniquely programmable for each weekday and holidays.
 - 5. Skip-day mode.

2.4 PHOTOELECTRIC RELAYS

- A. Outdoor Sealed Units: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.
 - 1. Light-Level Monitoring Range: 0 to 3500 fc (0 to 37 673 lx), with an adjustment for turn-on/turn-off levels.
 - 2. Time Delay: Prevents false operation.

2.5 OCCUPANCY SENSORS

- A. Ceiling and Non-Switch-Box Mounting Units: Unit receives control power from a separately mounted auxiliary power and control unit, and operates power switching contacts in that unit in response to signals from sensors.
 - 1. Auxiliary Power and Control Units: Matched to sensors with which used. Features as follows:

- a. Relays rated for a minimum of 20-A normal ballast load or 13-A tungsten filament or high-inrush ballast load.
 - b. Sensor Power Supply: Rated to supply the number of connected sensors.
- B. Switch-Box-Mounting Units: Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts rated 800 W at 120-V ac, and 1000 W at 277-V ac, minimum.
 - 1. Manual Override Switch: Turns lights on/off manually regardless of elapsed time delay.
- C. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.
 - 1. Time Delay for Turning Lights Off: Adjustable over a range from 1 to 15 minutes, minimum.
 - 2. Ambient-Light-Level Control: Adjustable for setting a level of ambient illumination above which sensor will not turn lights on when occupancy is sensed.
- D. Passive-Infrared Type: Detects occupancy by a combination of heat and movement in zone of coverage. Each sensor detects occupancy anywhere in an area of 1000 sq. ft. (93 sq. m) by detecting occurrence of 6-inch (150-mm) minimum movement of any portion of a human body that presents a minimum target of 36 sq. in. (232 sq. cm) to the sensor.
- E. Ultrasonic Type: Emits a beam of ultrasonic energy and detects occupancy through use of Doppler's principle in discerning movement in zone of coverage by sensing a change in pattern of reflected ultrasonic energy.
- F. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in the field by operating controls on unit.
- G. Unless otherwise noted, provide dual-technology type occupancy sensors where shown.

2.6 MULTIPOLE CONTACTORS AND RELAYS

- A. Description: Electrically operated and mechanically held, and complying with UL 508 and NEMA ICS 2.
 - 1. Listed Current Rating for Switching: Consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).
 - 2. Control Coil Voltage: Match control power source.

2.7 BASIC CONTROL CONTACTOR PANELS

- A. Description: Shall be UL listed and consist of following:
 - 1. Tub: Empty NEMA 1 enclosure that can accept an interior sized to accept up to 16, 32, or 64 contactor poles.
 - 2. Cover: Surface or Flush as required, with captive screws in a hinged, lockable configuration.
 - 3. Interior: Metal back plate and barrier for separation of high voltage (class 1) and low voltage (class 2) wiring. Intelligence board with eight channels of control provided

regardless of interior size. Interiors shall be provided with up to 16, 32, or 64 DIN rail mounted contactor poles.

B. Features:

1. Contactors shall be DIN rail mounted, four pole, normally closed, electrically held with coil voltage to match panel control power voltage. Contactors shall be compatible with all lighting, ballast and HID loads and be rated for 20 Amp tungsten up to 277V and rated for 30 Amp ballast and general use up to 600V. Provide 20% spare contactor poles.
2. Eight automatic control channels for operating contactors controlling exterior and/or interior lighting. Each channel shall be individually configurable to meet project needs. Each channel shall include an LED light status indicator to provide channel status and a separate ON/OFF/Auto switch for manual channel control.
3. Clock port for connection to an optional system clock. When a system clock is installed, eight override inputs are activated providing logic control of the eight channels from external photocells, switches, occupancy sensors, timers, daylighting controllers, etc.
4. Expansion terminals shall be provided for low voltage wiring connection between main and expansion panels in a multiple panel system. All automatic channel operation in the designated main panel (panel with the system clock), shall signal expansion panels' corresponding channels to operate.
5. Auxiliary power for operating optional system devices provides 350mA at 24VDC and 350mA at 24VAC power.

2.8 SYSTEM CLOCK

A. Description:

1. The system time clock shall be installed in the main or central panel of a multiple panel system or in each panel when individual panel time control is desired. The system clock shall provide time-based control with eight year time back-up, non-volatile memory program storage, automatic daylight savings adjustment, selectable 12/24 hour time formats and selectable date formats. All clock programming shall be accessible from the clock front display/keypad.

B. Features:

1. Control of eight control channels shall be available on the clock. Provide status and manual ON/OFF control of each channel from the front display and keypad.
2. The clock shall have control of eight individual override inputs, which can be used to connect external devices such as photocells, switches and daylighting controllers. Each of these inputs can be configured to operate as a photocell, as an ON/Auto switch, as a maintained ON/OFF switch, or as a momentary ON/OFF switch.
3. Schedules shall be assigned to any combination of days of the week and/or 3 holiday day types. Other scheduling features shall include:
 - a. Temporary schedules: schedules that execute on an assigned day then automatically delete themselves from memory.
 - b. Repeating schedules: repeat a schedule at intervals that are adjustable from 5 minutes to 10 hours.
4. 32 perpetual holidays assigned to any one of three holiday day schedules and continuing for 1 to 120 days. Holiday dates shall be specific day/month/year, or

perpetual dates including day/month/all years or day of the week in a given month every year or self-calculating Easter Sunday.

5. Astronomic capability for calculating sunrise and sunset based on time, latitude, longitude, and time zones. All scheduled astronomic/time operations shall be interlocked so loads are not turned on when astronomic off times are earlier than scheduled on times or astronomic on times are later than scheduled off times. Each schedule shall have an independent astronomic offset of + 120 minutes.
6. Following a power outage, the system clock shall run a start-up process that executes schedules that would have been missed during the power outage.

C. Description:

1. The exterior photocell shall offer a footcandle range of 1-15 and an eight-second time delay. The photocell shall mount on the exterior or roof of a building with its light level window facing the northern sky. The photocell shall provide an ON signal when the ambient light level drops below a user-defined dark setpoint, and an OFF signal when the ambient light level rises above a user-defined light setpoint.

D. Features:

1. The photocell shall use a set of normally open, isolated relay contacts that are rated for one Amp at 30 VAC/VDC.
2. The photocell shall have an adjustable ON/OFF dark setpoint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 26 Section "Basic Electrical Materials and Methods."
- B. Bundle, train, and support wiring in enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Basic Electrical Materials and Methods - Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- B. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
 1. Continuity tests of circuits.
 2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions. Record control settings, operations, and functional observations.

3. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 1 Section "Contract Closeout: Demonstration and Training."

END OF SECTION

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SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
 - 3. Field quality-control test reports.
 - 4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Protection Div.

c. Siemens Energy & Automation, Inc.

d. Square D.

2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Kitchen Areas: NEMA 250, Type 4.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- C. Conductor Connectors: Suitable for use with conductor material.
 - 1. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. Provide 20% space in all panelboards
- F. Panelboard Short-Circuit Rating:
 - 1. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components for all NEMA 3R panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
 1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."
- I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- J. Ground equipment according to Division 26 Section "Grounding and Bonding."
- K. Connect wiring according to Division 26 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION

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SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.
 - 4. Floor service outlets, poke-through assemblies and multi-outlet assemblies.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.
 - 2. Multi-outlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).

3. Poke-Through, Floor Service Outlets and Telephone/Power Poles:

- a. Hubbell Incorporated; Wiring Device-Kellems.
- b. Pass & Seymour/Legrand; Wiring Devices Div.
- c. Square D/Groupe Schneider NA.
- d. Thomas & Betts Corporation.
- e. Wiremold Company (The).

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. Straight-Blade Receptacles: Hospital grade.
- D. GFCI Receptacles: Straight blade, non-feed-through type, Hospital or Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.

2.3 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 1. Switch: 20 A, 120/277-V ac.
 2. Receptacle: NEMA WD 6, Configuration 5-15R.
- D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
 2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.
 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces:
 - a. Steel with white baked enamel, suitable for field painting

- b. 0.035-inch- thick, satin-finished stainless steel (above counters and in restrooms)
- 3. Material for Unfinished Spaces: Galvanized steel.
- 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-15R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: See telecommunication specifications for requirements.

2.6 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 - 1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks.
 - 2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
 - 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 5 voice and data communication cables.

2.7 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: PVC.
- C. Wire: No. 12 AWG.

2.8 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging.
- C. Install unshared neutral conductors on line and load side of dimmers.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION

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SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide new direct/indirect lighting with average of 50 foot-candles horizontal and minimum of 5 foot-candles vertical.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with
 - 1. CEC: California Electrical Code.
 - 2. UL:
 - a. UL 875 - Light Emitting Diode (LED) Lighting Sources for Use in Lighting Products.
 - b. UL 1598 - Luminaires.
 - c. UL 1012 - Power Units Other Than Class 2.
 - d. UL 1310 - Class 2 Power Units
 - e. UL 2108 - Low Voltage Lighting Systems
 - 3. ANSI:
 - a. C78.377.2008 Specifications for the Chromaticity of Solid State Lighting Products
 - 4. IESNA:
 - a. LM 79-80 - Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 - b. LM 80-08 - Approved Method for lumen Maintenance Testing of LED Light Sources.
 - c. TM 20-11 - Projecting Long Term Lumen Maintenance of LED Light Sources.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.3 SUBMITTALS

- A. Manufacturer's Product Data:
 - 1. List of Materials: For each item, Include:
 - a. Manufacturer.
 - b. Model number.
 - c. Listing: UL, City Lab or none.
 - d. Quantity.
 - 2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Air-Handling Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 15 Section "Diffusers, Registers, and Grilles."
 - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 - 2. Heat Removal Units: Air path leads through lamp cavity.
 - 3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
 - 4. Dampers: Operable from outside fixture for control of return-air volume.
 - 5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

2.3 LIGHTING FIXTURES

- A. Fixture: Energy efficient volumetric type meeting Title 24 and District standards.

2.4 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Light-emitting diodes with 25 years warranty..
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 EMERGENCY LIGHTING UNITS

- A. General: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.

5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.

2.6 LED LIGHTING

- A. Correlated color temperature (CCT): 3500 °K.
- B. Color rendering index (CRI): 75 minimum.
- C. Off-state power consumption: The power draw of the luminaire (including PE or remote monitoring unit) shall not exceed 2.50 watts when in the off state.
- D. Operating environment: Luminaire shall be able to operate normally in temperatures from -20° C to 50° C.
- E. Cooling system: Shall consist of a heat sink with no fans, pumps, or liquids, and shall be resistant to debris buildup that does not degrade heat dissipation performance.
- F. Lumen depreciation: LED module(s)/array(s) shall deliver at least 70% of initial lumens, when installed for a minimum of 100,000 hours.
- G. Lighting Distribution: Per lighting fixture schedule and in accordance with IESNA Lighting Distributions.
- H. Maximum amperage at LED: Maximum amperage at LED shall not exceed driver current to meet lumen depreciation value described above but shall not exceed 700 mA per mm² of chip. Multi-current (dimming) driver output shall be within the limits described in this Section. Provision only for dimming function controllable via networked control system.
- I. The Driver and LED arrays shall be designed for multi-current input operation, with adjustable ratings at 350 mA, 525 mA and 700 mA.
- J. Transient protection: Per IEEE C.62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100k HZ ring wave, Min. 10kV level, for both common mode and differential mode.
- K. Operating temperature: Power supply shall operate between -20° C and 50° C.
- L. Frequency: Output operating frequency must be ≥ 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.
- M. Interference: Power supplies shall meet FCC 47 CFR Part 15/18 (Consumer Emission Limits).
- N. Noise: Power supply shall have a Class A sound rating per ANSI Standard C63.4.
- O. Fixture Warranty: Manufacturer shall warranty to replace defective light fixtures or parts thereof for a period of 5 years.

2.7 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch.

- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage.
- E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.8 LIGHTING CONTROL DEVICES

- A. Dimming Driver Controls: Sliding-handle type with on/off control; compatible with driver and having light output and energy input over the full dimming range.
- B. Light Level Sensor: Detect changes in ambient lighting level and provide dimming range of 20 to 100 percent in response to change.
 - 1. Sensor Capacity: At least 40 electronic dimming driver.
 - 2. Adjustable Ambient Detection Range: 10 to 100 fc minimum
- C. Occupancy Sensors: Adjustable sensitivity and off delay time range of 5 to 15 minutes.
 - 1. Device Color:
 - a. Wall Mounted: White.
 - b. Ceiling Mounted: White.
 - 2. Occupancy detection indicator.
 - 3. Ultrasonic Sensors: Crystal controlled with circuitry that causes no detection interference between adjacent sensors.
 - 4. Infrared Sensors: With daylight filter and lens to afford coverage applicable to space to be controlled.
 - 5. Combination Sensors: Ultrasonic and infrared sensors combined.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Provide both grid and additional wire supports. Refer to DSA IR 25-2/1.11 for requirements.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 4. Continuous Rows: Suspend from cable.
- D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

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SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide pole and wall mounted exterior lighting per Code requirements and District Standards. General site lighting shall be 0.5 foot-candles average maintained.
- B. Provide emergency egress exterior lighting per CBC requirements with 1 foot-candles maintained light level along path of egress to public ways.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with:
 - 1. IEEE C2, "National Electrical Safety Code."
 - 2. CEC: California Electrical Code.
 - 3. UL:
 - a. UL 875 - Light Emitting Diode (LED) Lighting Sources for Use in Lighting Products.
 - b. UL 1598 – Luminaires.
 - c. UL 1012 - Power Units Other Than Class 2.
 - d. UL 1310 - Class 2 Power Units.
 - e. UL 2108 - Low Voltage Lighting Systems.
 - 4. ANSI:
 - a. C78.377.2008 Specifications for the Chromaticity of Solid State Lighting Products.
 - 5. IESNA:
 - a. LM 79-80 - Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 - b. LM 80-08 - Approved Method for lumen Maintenance Testing of LED Light Sources.
 - c. TM 20-11 - Projecting Long Term Lumen Maintenance of LED Light Sources.

1.3 SUBMITTALS

- A. Manufacturer's Product Data:
 - 1. List of Materials: For each item, Include:
 - a. Manufacturer.
 - b. Model number.
 - c. Listing: UL, City Lab or none.
 - d. Quantity.
 - 2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 EXTERIOR LUMINAIRES, GENERAL

- A. Complying with UL 1598 and listed for installation in wet locations.
- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

2.3 PHOTOELECTRIC RELAYS

- A. UL 773 or UL 773A listed, factory mounted to the luminaire.
- B. Contact Relays: Single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Contacts shall have directional lens in front of photocell to prevent fixed light sources to cause turnoff.
 - 1. Relay with locking-type receptacle shall comply with NEMA C136.10.
 - 2. Adjustable window slide for adjusting on-off set points.

2.4 LED LIGHTING

- A. Correlated color temperature (CCT): 3500 °K.
- B. Color rendering index (CRI): 75 minimum.
- C. Off-state power consumption: The power draw of the luminaire (including PE or remote monitoring unit) shall not exceed 2.50 watts when in the off state.
- D. Operating environment: Luminaire shall be able to operate normally in temperatures from -20° C to 50° C.
- E. Cooling system: Shall consist of a heat sink with no fans, pumps, or liquids, and shall be resistant to debris buildup that does not degrade heat dissipation performance.
- F. Housing: Shall be primarily constructed of metal. Unless otherwise noted, finish shall be white in color, powder coated and rust resistant, unless otherwise noted; driver shall be mounted internally, be replaceable, and be accessible without tools. Captive screws or use of latches are needed on any components that require maintenance after installation. For exterior fixtures, no parts shall be constructed of polycarbonate unless it is UV stabilized (lens discoloration shall be considered a failure under warranty); ingress Protection shall be rated a minimum of IP54.
- G. Lumen depreciation: LED module(s)/array(s) shall deliver at least 70% of initial lumens, when installed for a minimum of 100,000 hours.
- H. Lighting Distribution: Per lighting fixture schedule and in accordance with IESNA Lighting Distributions.
- I. Maximum amperage at LED: Maximum amperage at LED shall not exceed driver current to meet lumen depreciation value described above but shall not exceed 700 mA per mm² of chip. Multi-current (dimming) driver output shall be within the limits described in this Section. Provision only for dimming function controllable via networked control system.
- J. The Driver and LED arrays shall be designed for multi-current input operation, with adjustable ratings at 350 mA, 525 mA and 700 mA.
- K. Transient protection: Per IEEE C.62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100k HZ ring wave, Min. 10kV level, for both common mode and differential mode.
- L. Operating temperature: Power supply shall operate between -20° C and 50° C.
- M. Frequency: Output operating frequency must be ≥ 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.
- N. Interference: Power supplies shall meet FCC 47 CFR Part 15/18 (Consumer Emission Limits).
- O. Noise: Power supply shall have a Class A sound rating per ANSI Standard C63.4.
- P. Fixture Warranty: Manufacturer shall warranty to replace defective light fixtures or parts thereof for a period of 5 years.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lamps in each fixture.

- B. Luminaire Attachment: Fasten to indicated structural supports.
- C. Adjust luminaires that require field adjustment or aiming.

END OF SECTION

09/21/18

SECTION 27 00 00

GENERAL TECHNOLOGY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the General Conditions, Special Conditions, and the Sections included under Division 1 - General Requirements, are included as a part of this section as though bound herein.

1. DRAWINGS:

- a. The Drawings prepared for this Project are an outline to show where apparatus must go in order to harmonize with the building and installations of the various trades. Work must be installed in accordance with the drawings insofar as possible. Drawings shall be carefully checked during the course of bidding and construction. If discrepancies, errors, or omissions are discovered prior to or during the construction phase, notify the Owner's Agent immediately for interpretation or correction. Take necessary measurements and be responsible for same, including clearances for equipment that is to be furnished. The Owner shall reserve the right to make minor location changes of equipment where such adjustments are deemed desirable from an appearance or operational standpoint. Such changes will be anticipated sufficiently in advance to avoid extra work or unduly delayed progress on the Project.

1.2 SUMMARY

A. RELATED SECTIONS

- 1. The requirements of this Section supplement the General Conditions and shall apply to Work for Sections listed under Division 27 – Communications.

B. PERFORMANCE

- 1. Provide the labor, materials, equipment, appliances, services and transportation, and perform the operations in connection with the construction and installation of the Work. Work shall be as herein specified and as denoted on the accompanying Drawings.

1.3 DEFINITIONS

A. PRECEDENCE:

- 1. Precedence of project documents shall be as follows:
 - a. In the event of a discrepancy between the specifications and drawings, whichever is more stringent or calls for the highest quantity or quality of materials has precedence.

B. OMISSIONS:

1. The omission of express reference to any parts necessary for, or reasonably incidental to, a complete installation shall not be construed as a release from providing such parts.

C. ANCILLARY AND ACCESSORY ITEMS:

1. No exclusion from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the accessories necessary to complete any required system or item of equipment are to be omitted.

D. DRAWINGS:

1. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings and described in these specifications. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

E. ORDINANCES:

1. All work shall conform to all federal, state, and local ordinances and building official requirements.

F. BUILDING CODES:

1. All work shall conform to all state and local building codes and the following:
 - a. National Electrical Code (NEC)
 - b. National Fire Protection Association (NFPA)
 - c. EIA/TIA Standards and Recommendations.

G. UL LISTING:

1. All material and equipment shall be listed, labeled, or certified by Underwriter's Laboratories, Inc., where such standards have been established.

H. FCC APPROVAL:

1. The system shall be approved for direct interconnection to the utility services under Part 68 of FCC rules and regulations. Those systems that are not FCC approved or utilize an intermediary device for connection will not be considered. Provide FCC registration number of system being proposed with submittals.

I. SUBMITTALS:

1. GENERAL:

- a. Provide complete shop drawings and submittals for all systems specified within 30 days of notice of award or actual award of contract which ever occurs first. The Architect/Consultant will review and return submittals and shop drawings within fourteen (14) days. Failure to obtain submittal approval within sixty (60) days of contract award, where the delay is due to the poor performance of the contractor, may be cause for cancellation of the contract without penalty of the Owner.
- b. Where applicable, the Contractor will submit the greatest quantity of submittal copies noted herein or in the General or Supplemental Conditions of the project documents. If not noted elsewhere within the project documents, the Contractor will submit a minimum of five (5) sets of submittals and shop drawings.

- c. The Contractor should not consider the Consultant or Owner's review of submittals to be exhaustive or complete in every detail. Approval of submittals, including substitutions, indicates only the acceptance of intent to comply with general design or method of construction and quality as specified. The functional requirements, operations, arrangements, and quantities must comply with the contract documents unless changes are specifically approved in writing. Submittal approval does not relieve the Contractor of responsibility for errors in dimensions, details, sizes, etc. or coordinating items with actual building conditions. Contractor's responsibility for error and omissions in submittals is not relieved by the Consultant or Owner review of submittals.
 - d. Submittals and shop drawings will be provided in a single package, multiple partial submittals are not acceptable.
 - e. Submittals which, in the Consultant's opinion, are incomplete deviate significantly from the requirements of the Project Specifications, or contain numerous errors will be returned without review for rework and are to be re-submitted.
 - f. If submittals and/or drawings are rejected, or approved with noted changes and resubmittal required, the Contractor will correct the documents as required and resubmit within fourteen (14) days.
 - g. The Contractor will not fabricate products, begin work, or submit invoices for the scope of work defined in the project documents until return of submittals and shop drawings with Consultant acceptance.
2. SCALED DRAWINGS (Shop Drawings):
- a. Each drawing shall have a descriptive title and all subparts of each drawing shall be completely described. All drawings shall have the name of the project, Owner's name and address, consultant, and electronics contractor in the title block.
 - b. Cabinets:
 - 1) Provide complete scaled elevation drawings of all equipment racks with equipment identification number. Each drawing shall show all equipment with its manufacturer, model number, and specific room location. If other Contractor(s) are providing equipment in the room, this Contractor will coordinate the layout of the room with the other Contractor(s).
 - 2) Provide complete scaled floorplan drawings of all rooms where equipment racks or cabinets are located with location and orientation of every rack or cabinet shown. Provide dimensional relation of each piece of equipment to other pieces of equipment, room walls, and ceiling.
 - c. Backboards:
 - 1) Provide complete scaled elevation drawings of all backboards with equipment designations and locations. Provide dimensional relation of each piece of equipment to other pieces of equipment. If other Contractor(s) are providing equipment on the backboard, this Contractor will coordinate the layout of equipment on the backboard with the other Contractor(s).
 - d. Primary Cable Paths and Device Locations:

- 1) Provide complete scaled drawings detailing projected primary cable paths and locations of all equipment such as control panels, plug panels, video monitors, video projectors, equipment racks, speakers, etc... in quantities noted in the general requirements. These drawings will be utilized for "as-built" submittals with cable numbers noted at the end of the project.
- e. Assembly, Supports, and Panel/Plate Layout:
 - 1) Provide diagrammatic representation of all assemblies, i.e. monitor mount assembly, projector mount assembly, and connector panel and/or plate layout. Identify the components that make up the assembly or are used on the panel/plate. For connector panel or plate, indicate identification location and methodology.
- f. One-Line System Diagram:
 - 1) Provide one-wire drawings of all racks, consoles, control panels, and custom assemblies, etc., in quantities noted in the general requirements. Each drawing shall delineate circuit numbers for all cables and terminal connections. Provide typical wiring termination for all devices.
3. MANUFACTURERS PRODUCT DATA
 - a. Manufacturer Cut Sheets:
 - 1) Provide complete sets of a project material list with manufacturer specification sheets for each manufactured device utilized within the system in quantities noted in the general requirements. The Owners Agent will use these sets in determining that all products listed are being supplied as required.
 - b. Samples:
 - 1) Provide samples of the following:
 - a) Any plastic or custom metal panels.
 - b) All paint finishes of cabinets or custom assemblies. (These may be manufacturer cuts sheets indicating the various colors and finishes available).
 - c) Equipment identification tag material, labeling method, and numbering method.
 - d) Cable labeling material, labeling method, and numbering method.
 - e) Faceplate and modules of selected color for approval by Owner/architect.
 - f) Faceplate labeling material, labeling method, and numbering method.
4. SCHEDULE:
 - a. The Consultant has been retained by the Owner to provide inspection services throughout the duration of the project. Those services include:

- 1) Inspection of technology rough-in methodologies (cable installation and support methods, component support methodologies.)
 - 2) Inspection of cable, face plate, and cabinet termination and labeling methodologies.
 - 3) Review of Verification Test Reports.
 - 4) Attend and Witness Final Acceptance Test (Proof of Performance Tests).
 - 5) Verify Contractor provision of training requirements.
- b. The Contractor is required to provide a projected schedule of activities for the Consultant to plan site visits. The Contractor is responsible to notify the Consultant of any changes in their activity schedule due to change in the overall construction schedule or Contractor schedule. Provide dates for the following:
- 1) Date upon which 10% of the project cable is expected to be installed.
 - 2) Date upon which 10% of system supports are expected to be installed.
 - 3) Date upon which 10% of cable and plates are terminated and labeled.
 - 4) Date of Verification Test Report completion.
 - 5) Date of expected Final Acceptance Testing.
 - 6) Dates of expected Systems Training.

1.4 QUALITY ASSURANCE

A. GENERAL:

1. All equipment and materials required for installation under these specifications shall be new (less than 1 year from date of manufacture) and without blemish or defect.

B. SPECIFIC:

1. Each major component of equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. NEMA code ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible.

1.5 ACCEPTABLE MANUFACTURERS

- A. These specifications are based on equipment manufactured by or for specific manufacturers. It is not the intent of these specifications to limit or restrict submission of proposals for products by other manufacturers but to set a baseline of operational functions, which all proposals must meet.

1.6 INSTALLING CONTRACTOR QUALIFICATIONS

- A. The Premises Wiring contractor performing work under this Division 27, Section 27 15 00 shall be certified by the manufacturer of the equipment and components being furnished and be authorized by the manufacturer to install and convey the product warranty and performance guarantee to the Owner upon completion of contract. Installing contractor for all

other sections must have a minimum of three years previous experience in audio/visual systems, and/or data communications, and/or telecommunication systems. All contractors and/or vendors supplying all or parts of the work described herein shall supply three project references, which substantiate the contractor/ vendors' previous experience as noted herein and in addition Division 27 Section 27 15 00 contractor shall provide compliance to Section 27 15 00, paragraph 1.3 D.

- B. Provide three project references for all subcontractors supplying all or parts of the work described herein which substantiate their previous experience as noted herein.

PART 2 - PRODUCTS

2.1 DEVICE LOCATIONS

- A. Locate all apparatus requiring adjustments, cleaning, or similar attention so it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

2.2 SUPPORTS

- A. Provide and install brackets, braces, and supports as required. Minimum fastening and/or support safety factor shall be at least three (3). Design shall be to the approval of the Owner.

2.3 PAINTING

- A. All supporting structures and enclosures supplied by the contractor not having a standard factory paint finish shall be painted in a manner approved by the Owner.

2.4 PAINT COLOR

- A. Provide, as may be required, custom color and/or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be submitted to the Architect for approval. This does exclude equipment or materials where standard colors and finishes are specified herein, unless otherwise noted.

2.5 BLANK AND CUSTOM PANELS

- A. Finish of blank panels and/or custom assembly panels utilized for termination and/or interconnection as part of this system shall be stainless steel.
- B. In addition, provide blank plastic panels finished in matte (or satin) black to close off all spaces around the source equipment in the distribution room racks. These panels shall have cutouts that provide access to the source machine and its controls. Match each panel to the device it is covering in the racks. Submit a sample of the plastic with finish to the Consultant for approval.

2.6 MARKINGS

- A. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked in a manner approved by the Owner. Custom panel nomenclature shall be engraved, etched, or screened. Marking for these items are purposely

detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size, and/or placement with the Owner prior to marking. Mount on the custom rack panels as described above a designation of each source machine, which correlates to the system architecture. Submit a sample layout for Consultant approval.

2.7 ENVIRONMENT

- A. The equipment specified herein is designed to operate in environments of normal humidity, dust, and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.

2.8 REFERENCE STANDARDS

- A. NOTE: Educational facilities are unique facilities and do not specifically conform to the TIA/EIA standard, they are not commercial buildings that must flex with each new tenant. The Owner will deviate from the standard to enhance the instructional impact of the technology implementation. Deviations will be noted below:
 - 1. Quantity of drops in a given space.
 - 2. Quantity of drops within a single communications box.
 - 3. Use of a collapsed backbone data system architecture.
 - 4. Deletion of wiring closets (IDF).
 - 5. Fiber cable direct to the classroom.
 - 6. No patch panels in classrooms containing hub units.
 - 7. When wiring closets (IDF) are used, room size requirements are not strictly adhered to.
- B. Where practices noted within this specification do not adhere strictly to the TIA/EIA standards, The Owner has done so for a specific purpose related to educational facilities. For those areas deviating from the standard, this contractor will not be liable for complying with the TIA/EIA standards.
- C. The standard references for the layout and construction of the system shall be the current version of:
 - 1. GENERAL, (Includes Copper and Fiber):
 - a. TIA/EIA-568 - Commercial Building Standard for Telecommunications Wiring
 - b. TIA/EIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
 - c. TIA/EIA-606 - Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - d. TIA/EIA-607 - Commercial Building Grounding/Bonding Requirements.
 - e. BICSI-TDM Manuals-Building Industry Consulting Service International-Telecommunications Distribution Methods Manuals.
 - f. ANSI - American National Standards Institute

- g. UL Listed - Underwriter's Laboratories Listed
 - h. UL Certified - Underwriter's Laboratories LAN Cable Certification Program.
 - i. NEMA - National Electrical Manufacture's Association.
2. AUDIO:
- a. Handbook for Sound Engineers
 - b. The New Audio Cyclopedia (Howard W. Sams, Indianapolis, Indiana 1987)
 - c. Davis Sound System Engineering Second Edition (Howard W. Sams, Indianapolis, Indiana 1987)
3. VIDEO:
- a. National Association of Broadcasters.
 - b. Engineers Handbook.
4. ADDITIONAL: FIBER OPTICS
- a. Refer to the fiber optic cable manufacturers design guide:
 - 1) i.e. SIECOR:
 - a) Siecor Universal Transport System (UTS)
 - b) Design Guide, Siecor Corp.
 - 2) Brochure #CC-110
 - 3) Also refer to the following standards committees:
 - a) ANSI: Proposed Fiber Distributed Data Interface (FDDI) Physical Media Documents
 - b) Institute of Electrical & Electronic Engineers (IEEE) 802.8
 - c) Electronic Industries Association (EIA) Committees:
 - 4) TR4 1.8.1: Working Group on Commercial & Industrial Building Wiring Standard
 - 5) FO-6: Fiber Optic Committee.
 - 6) FO-6.7: Fiber Optic Cable Sub Committee.
 - 7) FO-2: Fiber Optic Systems Committee.
 - a) Insulated Cable Engineers Association Inc. (ICEA)
 - 8) WG 596: Fiber Optic Premises Distribution Cable.
 - 9) American Society for Testing Materials (ASTM):
 - 10) DO9.18, TG-12: Task Group on Fiber Optics

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

1. Perform this work in accordance with acknowledged industry and professional standards and practices, existing building conditions, and as specified herein. Provide and install all materials, devices, components, and equipment for complete, operational systems.
2. Maintain a competent supervisor and supporting technical personnel, acceptable to the Architect, during the entire installation. Change of the supervisor during the project shall not be acceptable without prior written approval from the Owner and the Owner's Agent.
3. Coordinate all efforts with those of related trades. In the event of any conflicts, delayed or improper preparatory work by others, notify the Owner's Agent. The Owner's Agent's decision will be binding. Verify all field conditions.

3.2 ELECTRICAL DISTRIBUTION

- A. Provide distribution of electrical power within the equipment racks with a minimum of one spare AC receptacle for each four in use per branch circuit or a minimum of two spare AC receptacles per branch circuit, whichever is greater. Power will be made available in each area. Where applicable, coordinate extension of those circuits by the District.

3.3 BOXES

A. MOUNTING

1. With the exception of portable equipment, all boxes, conduits, cabinets, equipment and related wiring shall be held firmly in place and the mounting shall be plumb and square. All boxes shall be rigidly and securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.

B. WIRING

1. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes shall be avoided. Where deemed necessary and approved, they shall be barrier.

C. CLEANING:

1. Clean all box interiors thoroughly before installing plates, panels, or covers.

3.4 WIRING METHODS & PRACTICES

A. SUPERVISION

1. Installation of all audio, video, control, and/or fiber cable to be provided under this scope of work is by this contractor. Supervision to include, but not be limited to ensuring proper:
 - a. Pulling Tensions.
 - b. Quantities.

1. Provide ample service loops at each termination and/or per drawings so that plates, panels, and equipment can be dismounted for service and inspection. Provide the following as a minimum:
 - a. Outlet box: Eighteen (18) inches from wall surface to jack.
 - b. Termination panel: Four (4) inches behind termination panel from last cable tie to jack.
 - c. Fiber terminations: Eighteen (18) inches of service loop coiled and stored in junction box (refer to NEC for proper sizing of junction boxes and pull boxes). Take care not to exceed bend radius of fiber per recommended telecommunications standards.

H. NON-CABLE TRAY INSTALLATION

1. All cable installations which are not supported by a cable tray or conduit system and where educational technology system cables are allowed to be placed loosely in the ceiling must follow the TIA/EIA standard methodology as noted in TIA/EIA 569 - Part 4.6 Ceiling Pathways. Specifically, sections 4.6.1 General, 4.6.2 Design Guidelines, and 4.6.5 Cable Support. Those sections are paraphrased herein (the contractor will be familiar with the specifics of these sections and install their cables in accordance with the standard or as noted herein).
2. The installation of all education technology cabling, regardless of type and separation requirements, from the head end room to various zones throughout the facility will use common pathway routes.
3. Inaccessible ceiling areas, such as lock-in ceiling tiles, drywall or plaster, will not be used as distribution pathways. Should the contractor find inaccessible ceiling areas as the only available pathway, the contractor will notify the Owner's Agent immediately for direction prior to proceeding with the cable installation.
4. Accessible ceiling areas must have adequate and suitable space available for the distribution layout (minimum of three inches clear vertical space between ceiling tiles and distribution wiring and pathway).
5. The design shall provide a suitable means and method for supporting cables and wires from the head end room (and/or telecommunications closet) to the area being served. The cable will not be laid directly on the ceiling tiles or rail. The Owner allows the use of "Caddy - Multifunction Clip" (as manufactured by ERICO or other equivalent manufacturer) installed on the ceiling support wire at a minimum height of eighteen inches above the tile and utilizing the appropriate D-ring or bridle ring for the installation of cable within a single zone.
6. Cable support will be provided through the use of open-top cable supports located on 48-60 inch centers. Where large quantities of cables (50-75) are bunched together in the ceiling at a congested area, the contractor will use multiple open-top cable supports or a special support designed to carry the additional weight.
7. A single classroom or suite of offices (with an area not exceeding 1200 square) feet will be considered a single telecommunication zone. Instructional spaces which exceed the 1200 square foot limit must be brought to the attention of the Owner's Agent for review and approval as a single zone. Loose cables from each zone to the telecommunications closet or headend room will be grouped and tied.

I. WIRING HARNESSES

1. All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses, tied with Velcro tie wraps and supported in accordance with accepted engineering practice.
2. Harnessed cables shall be combed straight. Each cable that breaks out from a harness for termination shall be provided with an ample service loop.
3. Harnessed cables shall be formed in either a vertical or horizontal relationship to equipment, controls, components, or terminations.

J. FIBER OPTIC CABLE

1. All cable shall be installed and terminated in accordance with the manufacturer's recommended procedures. All cables shall be continuous between terminals with no splicing. All cables will be terminated with SC type connectors and terminated into their respective classroom terminals and central racks.

3.5 GROUNDING

A. GROUNDING PROCEDURE

1. The system wiring will conform to the following procedures:

ITEM	PROCEDURE
Equipment AC Ground Pins:	Connect to AC ground.
Equipment Chassis:	Connect to AC ground and/or rack frames
Rack Frames:	Connect to AC ground. Use insulated bushings for all conduit connections
Shielded Cable Between AC powered equipment:	Connect to ground at one end only.
Unbalanced Equipment:	Float chassis from rack.
Conduit/Back Boxes:	Isolate system wiring, including AC power, from all conduits and permanent backboxes
AC Ground:	Green wire (grounding conductor) system shall be isolated from all other facility grounds. Connects at one point to earth.

B. METALLIC CONDUIT & ENCLOSURES

1. All metallic conduit, boxes, and enclosures shall be permanently and effectively grounded in accordance with the National Electrical Code. Metallic enclosures containing active equipment shall be grounded with due regard for minimization of electrical noise.

3.6 EQUIPMENT RACKS

A. GENERAL

1. The equipment racks shall be vented and considered as custom assemblies and shall be assembled, wired, and tested in a properly equipped shop maintained by the contractor. Assembly of racks on site will not be permitted.

B. EQUIPMENT LOCATION

1. Placement of equipment in equipment racks is for maximum operator convenience. Verify any changes in placement prior to assembly with the Owners Agent. All system components and related wiring will be located with due regard for the minimization of induced electromagnetic and electrostatic noise, for the minimization of wiring length, proper ventilation, and to provide reasonable safety and convenience for the operator. Fans shall be provided if required for proper ventilation. All cabling to the racks shall be ceiling access and within enclosures extending from the racks into the ceiling area.

C. RACK INSTALLATION

1. Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.

D. IDENTIFICATION

1. All terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled in a manner acceptable to the Owner as to their function, circuit, or system as appropriate. Labeling on manufactured equipment shall be engraved plastic laminate with white lettering on black background or dark background. Handwritten identification is not permitted. The contractor may substitute metallized polyester permanent identification labels with black printing on silver, white, or another light color background for the phenolic labels above.

3.7 CABLE TEST METHODOLOGY

A. TEST DOCUMENTATION

1. Upon substantial completion of the data network and interfacing of the Owner supplied equipment, test every data port for the functional requirements as listed in previously. Document, on a contractor generated form, the compliance of every port and the testing individual will initialize the results of each location. Submit a written report detailing the results of initial adjustments and verification tests including all relevant drawings, charts, and photographs.

B. FIELD TEST REQUIREMENTS FOR A BALANCED TWISTED-PAIR CABLING SYSTEM

1. Every cabling link in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B.2-1 (June 2002) Section 11.2: "100-Ohm twisted-pair transmission performance and field test requirements".
2. The installed twisted-pair horizontal links shall be tested from the IDF in the telecommunications room to the telecommunication wall outlet in the work area against the "Permanent Link" performance limits specification as defined in ANSI/TIA/EIA-568-B.2-1 (June 2002).
3. 100% of the installed cabling links must be tested and must pass the requirements of the standards mentioned in subsection 1 above and as further detailed in Section 27 15 00 - Horizontal Cabling. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation as described below.
4. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals).

5. The test equipment (tester) shall comply with or exceed the accuracy requirements for enhanced level II (Level II-E) field testers as defined in TIA-568-B; Annex I: Section I.4. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table I.4 of Annex I of TIA/EIA-568-B.2. (Table I.5 in this TIA document specifies the accuracy requirements for the Channel configuration.)
6. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
7. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction. The Fluke DSP-LIA101S permanent link adapter available for the DSP-4000 Series CableAnalyzer™ is an example of a tester interface that fully complies with this requirement.
8. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Section 27 15 00 - Horizontal Cabling). Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
9. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. (Reference TIA-568-B; Annex I: Section I.2.2)
10. A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase 5 business days before testing commences.
11. A representative of the end-user will select a random sample of 10% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in accordance with the prescriptions in Section 27 15 00 - Horizontal Cabling. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

C. BALANCED TWISTED-PAIR CABLING SYSTEM PERFORMANCE TEST PARAMETERS

1. The test parameters for Cat 6 are defined in ANSI/TIA/EIA standard 568-B.2-1 "*Parameters to be reported*". The test of each Cat 6 link shall contain all of the following parameters as detailed below. In order to pass the link test all measurements (at each frequency in the range from 1MHz through 250MHz) must meet or exceed the limit value determined in the above-mentioned Cat 6 standard.

- a. Wire Map [as defined in TIA/EIA-568-B.2-1]: Wire Map shall report Pass if the wiring of each wire-pair from end to end is determined to be correct. The Wire Map results shall include the continuity of the shield connection if present.
- b. Length [as defined in TIA/EIA-568-B.2-1]: The field tester shall be capable of measuring length of all pairs of a permanent link or channel based on the propagation delay measurement and the average value for NVP. The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the permanent link configuration (90 meters – 295 ft) or the channel (100 meters – 328 ft) plus 10% to allow for the variation and uncertainty of NVP.
- c. Insertion Loss (Attenuation) [as defined in TIA/EIA-568-B.2-1]: Insertion Loss is a measure of signal loss in the permanent link or channel. The term ‘Attenuation’ has been used to designate “insertion loss”. Insertion Loss shall be tested from 1 MHz through 250 MHz in maximum step size of 1 MHz. It is preferred to measure attenuation at the same frequency intervals as NEXT Loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk Ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results for the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which this worst case value occurs, and the test limit value at this frequency.
- d. NEXT Loss, pair-to-pair [as defined in TIA/EIA-568-B.2-1]: Pair-to-pair near-end crosstalk loss (abbreviated as NEXT Loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations). This parameter is to be measured from 1MHz through 250MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT Loss measurements shall not exceed the maximum step size defined in the standards as shown in Table 1, column 2. A smaller step size more accurately identifies worst case margin conditions (see summary results, below).

Table 1		
Frequency Range (MHz)	Maximum Step size (MHz)	Fluke DSP-4000 Fluke DSP-4100
1 – 31.25	0.15	0.10
31.26 – 100	0.25	0.20

Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst case NEXT margin (1) and the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

- e. PSNEXT Loss [as defined in TIA/EIA-568-B.2-1]: Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link-under-test (a total of 8 results). PSNEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all

other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1MHz through 250MHz and the step size may not exceed the maximum step size defined in the standards as shown in Table 1, column 2.

- f. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst case margin and the wire pair that exhibits the worst value for PSNEXT. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- g. ELFEXT Loss, pair-to-pair [as defined in TIA/EIA-568-B.2-1]: Pair-to-pair FEXT Loss shall be measured for each wire-pair combination from both ends of the link-under-test. FEXT Loss measures the unwanted signal coupling (crosstalk disturbance) on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to compute ELFEXT Loss that must be evaluated and reported in the test results. ELFEXT measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire-pair combinations. ELFEXT is to be measured from 1MHz through 250MHz and the maximum step size for FEXT Loss measurements shall not exceed the maximum step size defined in the standards as shown in Table 1, column 2. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst case margin and the wire pair combination that exhibits the worst value for ELFEXT. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- h. PSELFEXT Loss [as defined in TIA/EIA-568-B.2-1]: Power Sum ELFEXT is a calculated parameter that combines the effect of the FEXT disturbance from three wire pairs on the fourth one. This test yields 8 wire-pair combinations. Each wire-pair is evaluated from 1MHz through 250MHz in frequency increments that do not exceed the maximum step size defined in the standards as shown in Table 1, column 2. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst case margin and the wire pair that exhibits the worst value for PSELFEXT. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- i. Return Loss [as defined in TIA/EIA-568-B.2-1]: Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standards as shown in Table 1, column 2. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst case margin and the wire pair that exhibits the worst value for Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- j. ACR (Attenuation to crosstalk ratio): ACR provides an indication of bandwidth for the two wire-pair network applications. ACR is a computed parameter that is analogous to ELFEXT and expresses the signal to

noise ratio for a two wire-pair system. This calculation yields 12 combinations – six from each end of the link. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst case margin and the wire pair combination that exhibits the worst value for ACR. These wire pair combinations must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

- k. PSACR: The Power Sum version of ACR is based on PSNEXT and takes into account the combined NEXT disturbance of all adjacent wire pairs on each individual pair. This calculation yields 8 combinations – one for each wire pair from both ends of the link. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst case margin and the wire pair that exhibits the worst value for PSACR. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- l. Propagation Delay [as defined in TIA/EIA-568-B.2-1:Propagation delay is the time required for the signal to travel from one of the link to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst case propagation delay. The report shall include the propagation delay value measured as well as the test limit value.
- m. Delay Skew [as defined in TIA/EIA-568-B.1; Section 11.2.4.11]. This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

D. BALANCED TWISTED-PAIR CABLING SYSTEM TEST RESULT DOCUMENTATION

- 1. The test results information for each link shall be recorded in the memory of the field tester upon completion of the test.
- 2. The test results records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test and that these results cannot be modified at a later time. Superior protection in this regard is offered by testers that transfer the numeric measurement data from the tester to the PC in a non-printable format such as the Fluke DSP-4000 Series CableAnalyzer™.
- 3. The database for the completed job shall be stored and delivered on CD-ROM including the software tools required to view, inspect, and print any selection of test reports.
- 4. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information.
 - a. The identification of the link in accordance with the naming convention defined in the overall system documentation:

- b. The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number.
 - c. The date and time the test results were saved in the memory of the tester.
- 5. General Information to be provided in the electronic data base with the test results information for each link:
 - a. The identification of the customer site as specified by the end-user.
 - b. The identification of the link in accordance with the naming convention defined in the overall system documentation.
 - c. The overall Pass/Fail evaluation of the link-under-test.
 - d. The name of the standard selected to execute the stored test results.
 - e. The cable type and the value of NVP used for length calculations.
 - f. The date and time the test results were saved in the memory of the tester.
 - g. The brand name, model and serial number of the tester.
 - h. The identification of the tester interface.
 - i. The revision of the tester software and the revision of the test standards database in the tester.
 - j. The test results information must contain information on each of the required test parameters that are listed in Section 27 15 00 - Horizontal Cabling and as further detailed below under paragraph 6.
- 6. The detailed test results data to be provided in the electronic database for each tested link must contain the following information:
 - a. For each of the frequency-dependent test parameters, the minimum test results documentation shall be stored for each wire-pair or wire-pair combination as observed from each end of the link. The minimum test results documentation for each test parameter shall be in compliance with the information described herein.
 - 1) Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.5 m *[optional: foot]* and the test limit value
 - 2) Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value
 - 3) Delay Skew: Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value
 - 4) Insertion Loss (Attenuation): Minimum test results documentation as explained in Section 27 15 00 - Horizontal Cabling for the wire pair with the worst insertion loss
 - 5) Return Loss: Minimum test results documentation as explained in Section 27 15 00 - Horizontal Cabling. Identify as detected from each end of the link, the wire pair that exhibits the worst case margin and the wire pair with the worst RL. Each reported case shall include the

frequency at which it occurs as well as the test limit value at this frequency.

- 6) NEXT, ELFEXT, ACR: Minimum test results documentation as explained in Section 27 15 00 - Horizontal Cabling. Identify as measured from each end of the link, the wire pair combination that exhibits the worst case margin and the wire pair combination that delivers the worst case value. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- 7) PSNEXT, PSELFEXT, and PSACR: Minimum test results documentation as explained in Section 27 15 00 - Horizontal Cabling. Identify as detected from each end of the link, the wire pair that exhibits the worst case margin and the wire pair with the worst value. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
- 8) Link length, propagation delay, and delay skew shall be reported for each wire pair as well as the test limit for each of these parameters.

E. FIBER DISTRIBUTION SYSTEM VERIFICATION TESTS

1. Every fiber optic cabling link in the installation shall be tested in accordance with the field test specifications defined by the CENELEC (Comité Européen de Normalisation Electrotechnique) standard ISO/IEC 11801, TIA/EIA T568b.3 or by the appropriate network application standard(s) whichever is more demanding.
2. ISO/IEC 11801 defines the passive cabling network, to include cable, connectors, and splices (if present), between two optical fiber patch panels (connecting hardware). A typical horizontal link segment is from the telecommunications outlet/connector to the horizontal cross-connect. A building backbone cabling subsystem extends from building distributor(s) to the floor distributor(s). The test shall include the representative connector performance at the connecting hardware associated with the mating of patch cords. The test does not, however, include the performance of the connector at the interface with the test equipment.
3. 100% of the installed cabling links must be tested and must pass the requirements of the standards mentioned in E.1 above and as further detailed in Section 27 15 00 - Horizontal Cabling. Any failing link must be documented, diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation.
4. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:
 - a. the manufacturer of the fiber optic cable and/or the fiber optic connectors
 - b. the manufacturer of the test equipment used for the field certification
 - c. training organizations authorized by BICSI (Building Industry Consulting Services International with headquarters in Tampa, Florida), Btec or City & Guilds.
5. The test equipment shall comprise optical power source and meter equipment in accordance with IEC 61280-4-1 (for multimode optical fibers) and IEC 61280-4-2 (for single mode optical fibers). The type of optical source and launch condition shall correspond with one of the categories defined in IEC 61280-4-1 (for multimode optical

fibers) and IEC 61280-4-2 (for single mode optical fibers). The cabling interface adaptors consist of a number of test cords mating in accordance with IEC 61280-4-1 (for multimode optical fibers) and IEC 61280-4-2 (for single mode optical fibers). It is recommended to use a mandrel wrap and, where appropriate, cladding mode stripping techniques in order to maximize measurement repeatability. These should be established within the test cord. The mandrel used should be in accordance with IEC 61300-3-34 (5x15 mm for 50/125 µm optical fiber).

6. The test equipment shall be within the calibration period recommended by the manufacturer in order to achieve the manufacturer-specified measurement accuracy. This period is normally 12 months.
7. The fiber optic launch cables and adapters must be of high quality and the cables shall not show excessive wear resulting from repetitive coiling and storing of the test equipment interface adapters. No index matching gel shall be used.
8. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests.
9. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.
10. A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five (5) business days before testing commences.
11. A representative of the end-user will select a random sample of 10% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in accordance with the prescriptions in Section 27 15 00 - Horizontal Cabling. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

F. FIBER DISTRIBUTION SYSTEM PERFORMANCE TEST PARAMETERS

1. ISO/IEC 11801 prescribes the single performance parameter for field testing of fiber optic links as link attenuation (alternative and equivalent term: insertion loss), when installing components compliant with this standard.
2. The link attenuation shall be calculated in accordance to the specifications within ISO/IEC 11801. These specifications are representative of the following formulas.

$$\begin{aligned} \text{Link Attenuation} &= \text{Cable Attn} + \text{Connector Attn} + \text{Splice Attn} \\ \text{Cable Attn (dB)} &= \text{Attenuation Coefficient (dB/km)} * \text{Length (km)} \end{aligned}$$

3. The values for the *Attenuation Coefficient* are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation_Coefficient (dB/km)
Multimode 50/125 µm	850	3.5
	1300	1.5
Single-mode	1310	1.0
	1550	1.0

Connector Attn (dB) = number of connector pairs * connector loss (dB)

Maximum allowable connector loss = 0.75 dB

Splice Attn (dB) = number of splices (S) * splice loss (dB)

Maximum allowable splice loss = 0.3 Db

4. Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
5. Test equipment such as the Fluke DSP-FTA410S for multimode using LEDs, the DSP-FTA440S for gigabit Ethernet multimode using VCSELs, or the DSP-FTA430S for singlemode using lasers that measures the link length and automatically calculates the link loss based on the above formulas is preferred.
6. The above link test limits attenuation are based on the use of the One Reference Jumper Method specified by Method 1 of IEC 61280-4-1 for multimode and Method 1 of EN 61280-4-2 for singlemode (or the equivalent method explained in Fluke Networks application note "Loss Testing of Premises Fiber Optic Links" (Lit # 1560065)). The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.
7. The horizontal link (multimode): acceptable link attenuation for a multimode horizontal optical fiber cabling system is based on the maximum 90 m distance. The horizontal link should be tested at 850 nm and 1300 nm in one direction in accordance with Method 1 of IEC 61280-4-1, One Reference Jumper or Fluke Networks application note "Loss Testing of Premises Fiber Optic Links" (Lit # 1560065).
8. The backbone link (multimode) shall be tested in one direction at both operating wavelengths to account for attenuation deltas associated with wavelength.
9. Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with Method 1 of IEC 61280-4-1.
10. Because backbone length and the potential number of splices vary depending upon site conditions, the link attenuation equation shall be used to determine limit (acceptance) values.
11. Single-mode backbone links shall be tested at 1310 nm and 1550 nm in accordance with IEC 61280-4-2, One Reference Jumper or the equivalent method outlined in Fluke Networks application note "Loss Testing of Premises Fiber Optic Links"(Lit # 1560065).
12. All single-mode links shall be certified with test tools using laser light sources at 1310 nm and 1550 nm (See Note below).

a. NOTE:

- 1) Links destined to be used with network applications that use laser light sources (underfilled launch conditions) shall be tested with test equipment based on laser light sources categorized by a Coupled Power Ratio (CPR) of Category 2, Underfilled, per IEC 60825-2. This rule should be followed for cabling systems to support Gigabit Ethernet. Gigabit Ethernet only specifies laser light sources. Field test equipment based on LED (light emitting diode) light sources is a Category 1 device per IEC 60825-2 and typically yields high attenuation results.
- 2) For Gigabit Ethernet compliant certification (IEEE STD 802.3Z application), use test equipment such as the Fluke DSP-FTA440S which uses a

VCSEL (Vertical cavity surface emitting laser) at 850 nm (compliant with 1000BASE-SX) and an FP laser at 1310 nm (compliant with 1000BASE-LX).

G. FIBER DISTRIBUTION SYSTEM PERFORMANCE TEST PARAMETERS TEST RESULT DOCUMENTATION

1. The test result information for each link shall be recorded in the memory of the field test equipment upon completion of the test.
2. The test result records saved by the test equipment shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.
3. A guarantee must be made that these results are transferred to the PC unaltered, i.e., "as saved in the test equipment" at the end of each test.
4. The popular 'csv' format (comma separated value format) does not provide adequate protection and shall not be acceptable.
5. The database for the completed job – including twisted-pair copper cabling links if applicable –shall be stored and delivered on CD-ROM; this CD-ROM shall include the software tools required to view, inspect, and print any selection of test reports.
6. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
 - a. The identification of the link in accordance with the naming convention defined in the overall system documentation.
 - b. The overall Pass/Fail evaluation of the link-under-test including the Attenuation worst case margin (margin is defined as the difference between the measured value and the test limit value).
 - c. The date and time the test results were saved in the memory of the test equipment.
7. General Information to be provided in the electronic data base containing the test result information for each link:
 - a. The identification of the customer site as specified by the end-user.
 - b. The overall Pass/Fail evaluation of the link-under-test. The name of the standard selected to execute the stored test results.
 - c. The cable type and the value of the 'index of refraction' used for length calculations.
 - d. The date and time the test results were saved in the memory of the test equipment.
 - e. The brand name, model and serial number of the test equipment.
 - f. The revision of the test equipment software and the revision of the test standards database in the test equipment.
8. The detailed test results data to be provided in the electronic database for each tested optical fiber must contain the following information:

- a. The identification of the link/fiber in accordance with the naming convention defined in the overall system documentation.
- b. The attenuation measured at each wavelength, the test limit calculated for the corresponding wavelength and the margin (difference between the measured attenuation and the test limit value).
- c. The link length shall be reported for each optical fiber for which the test limit was calculated based on the formulas previously shown.
- d. All fiber optic cable shall be factory tested on a reel basis with performance data for each cable supplied to the contractor and to the Owner. Tests shall be conducted utilizing an OTDR (Optical Time Domain Reflectometer) at 850nm and 1300 nm with the attenuation in dB/km recorded for each fiber.

3.8 VERIFICATION TEST REPORT

- A. Submit a written report detailing the results of initial adjustments and verification tests including all relevant drawings, charts, and photographs. This report will be completed and submitted for review at least five (5) days prior to acceptance testing.

3.9 ACCEPTANCE TESTING

- A. The Acceptance Testing and provision of testing equipment will be the responsibility of and performed by the Contractor in the presence of the Owner, Architect, or the Owner's representative. Coordinate this period so that free access, work lighting, electrical is available on the site.
- B. Should the contractor schedule an Acceptance Test and the system or components are not ready for or fail Acceptance Testing, the contractor will pay for all subsequent trips and man-hours required for the consultant to properly document specification conformance by the contractor. The Owner will have the right to reduce pay requests or final application of payment to the contractor in an amount equal to the travel costs and man-hours expended by the Consultant and charged to the contractor. The Owner would then pay the Consultant from the funds withheld from the contractor.
- C. Upon witness of the Acceptance Testing and the determination, in the Consultant's opinion, that the Contractor has falsified the Verification Test Reports, the Owner has the right to hire an Independent Testing Agency to provide outside verification of the results. Falsification of the test results is defined as cables shown as testing correctly in the Verification Report fail during the Acceptance Testing. (The Contractor has the right to hire an Independent Testing Agency approved by the Consultant and the Owner directly.) Furthermore, the Owner will have the right to reduce pay requests or final application of payment to the Contractor in an amount equal to the travel costs and man-hours expended by the Independent Testing Agency and Consultant and charged to the contractor. The Owner would then pay the Independent Testing Agency and Consultant from the funds withheld from the contractor.

3.10 SYSTEM DOCUMENTATION

- A. Prior to final acceptance tests, the Contractor shall submit to the Owner three copies of an operating and maintenance manual for the system that has been installed. These manuals will be used during the final acceptance testing of the system. Each manual will contain the following information:
- B. As-built project drawings. Provide three copies.

- C. Manufacturer Operation and Maintenance manuals. Provide three copies.
- D. Where applicable, single line diagrams showing levels throughout system and impedances. Provide three copies.
- E. Copies of Training materials. Provide three copies
- F. Verification and Acceptance Test Reports. Provide three copies.

END OF SECTION

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SECTION 27 05 26

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the General Conditions, Special Conditions, Sections included under Divisions 1, 26, and 27 are included as part of this section as though bound herein.
- B. Section 27 00 00 - General Technology Requirements.
- C. Section 27 15 00 - Horizontal Cabling.

1.2 SUMMARY

- A. This Section specifies the minimum materials and performance standards for grounding and bonding installed specifically for telecommunication systems in San Rafael City Schools new construction and remodels.
 - 1. Sections include:
 - a. Grounding electrodes and conductors.
 - b. Grounding electrodes.
 - c. Equipment grounding conductors.
 - d. Bonding.

1.3 REFERENCES

- A. American National Standards Institute (ANSI) Publication C2-97 – National Electrical Safety Code; ANSI/IEEE Std. 1100-1999 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems; ANSI/NFPA 780 – Lightning Protection Code Electronic Industries Association and Telecommunication Industries Association (EIA/TIA) Publications:
 - 1. EIA/TIA 568B – Commercial Building Telecommunications Wiring Standard.
 - 2. EIA/TIA 569 – Commercial Building Standard for Telecommunications Pathways.
 - 3. EIA/TIA 607 – Grounding and Bonding for Communications.
- B. Institute of Electrical and Electronic Engineers (IEEE) Publication 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- C. National Fire Protection Association (NFPA) Publication:
 - 1. NFPA 70 – National Electrical Code (NEC).
 - 2. NFPA 780 – Lightning Protection Code.
- D. Underwriters Laboratories, Inc. (U.L.) Publications:
 - 1. UL 83 - Thermoplastic Insulated Wires.
 - 2. UL 467 - Grounding and Bonding Equipment.
 - 3. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

1.4 REGULATORY REQUIREMENTS

- A. The Contractor shall conform to requirements of the National Electrical Code Article 250, California Electrical Code, and requirements for EIA/TIA 607.
- B. The Contractor shall furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to the SRCS as suitable for purpose specified and shown.

1.5 PERFORMANCE REQUIREMENTS

- A. Grounding system resistance shall be 5 ohms or less unless otherwise indicated.
- B. A telecommunications ground in the form of telecommunication main ground busbar (TMGB) shall be installed in the Main Distribution Frame (MDF) cabinet. It will be directly attached and effectively bonded to the closest point in the building's electrical service grounding electrode system.
- C. In the event the building's service grounding electrode system is not in close proximity of the TMGB, install a driven ground rod for the telecommunication grounding system.
- D. Each Building Distribution Frame (BDF) shall be effectively bonded with the TMGB in the MDF. Each BDF ground shall be a separate grounding conductor between the BDF and the MDF.

1.6 SUBMITTALS

- A. The following information shall be submitted for review and approval in accordance with Section 26 05 26, "Grounding and Bonding".
 - 1. Catalog Cut:
 - a. Ground Rod.
 - b. Ground Connectors
 - c. Telecommunications Main Grounding Busbar.
 - 2. Ground resistance from each major piece of equipment to the ground electrode. Equipment shall include, but not be limited to the following:
 - a. Main Distribution Frame (MDF).
 - b. Building Distribution Frame (BDF).

1.7 WARRANTY

- A. Warranty shall comply with the provisions of Section 01 78 36, "Warranties."

PART 2 - PRODUCTS

2.1 TELECOMMUNICATION MAIN GROUNDING BUS BAR (TMGB)

- A. Provide 2" wide x 3/16" thick copper ground bus, (length as necessary to accommodate all MDF/BDFIDF ground connections).

2.2 GROUND RODS

- A. Provide copper clad steel with adequate diameter to permit driving it full length of the rod in the earth but not less than 3/4-inch. Length shall be 10-feet unless otherwise indicated.

2.3 GROUNDING AND BONDING CONDUCTORS

- A. Grounding and bonding conductors shall be sized in accordance with Table for equipment grounding conductors, NEC. 250, ANSI/TIA/EIA – 607.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Make mechanical and electrical contact at all MDFs and BDFs. Permanently and effectively ground all equipment as required by all applicable codes, regulations and standards.
- B. Drive ground rods full length in a depression at least six (6)-inches below finished grade.
 - 1. Provide minimum No. 3/0 AWG, insulated, stranded copper grounding conductor between TMGB in MDF and electrical system ground
 - 2. Provide minimum No. 6 AWG, insulated, stranded copper grounding conductor between individual BDFs and the MDF TMGB.

3.2 TESTS

- A. All testing shall be performed by the technology contractor and shall be witnessed by the Architect and/or the District's designated representative.
- B. As an exception to requirements that may be stated elsewhere in the contract, the Consultant shall be given five (5) working days notice prior to each test.
- C. The testing equipment and devices used in performing the required tests shall have a calibration sticker affixed to the device stating the date when calibrated, date due for re-calibration, and the signature of the individual who did the calibration. In addition to the sticker, a certificate shall also contain the brand name and the serial number of the device.
- D. Ground Rod Test: Test ground rods for ground resistance value before any wire is connected. A portable testing megger shall be used to test each ground or group of grounds. The auxiliary or reference ground rods shall be 3/4-inch copper clad steel, not less than 4-feet in length and driven 3-1/2 feet deep, and shall be installed in a straight line from the ground being tested. Number 14 AWG stranded wire leads with at least 600 volt rubber insulation shall be connected to binding post on the instrument.

1. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground electrode under test. Provide one (1) copy of the megger manufacturer's directions for use of the ground megger indicating the methods to be used.
- E. Test Report (Submit four (4) copies in writing):
1. Grounding electrodes and systems (identifying electrodes and systems, each test).

END OF SECTION

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SECTION 27 15 00

HORIZONTAL CABLING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in the Specifying Documentation.

1.2 SCOPE OF WORK

- A. This document describes the requirements for the contractors, products and installation relating to furnishing and installing Telecommunications Cabling systems.
- B. The Horizontal Cabling System as described in this document is comprised of cabling, infrastructure, Cable tray pathways and termination devices for Data systems.
- C. Contractor will provide a bid including all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in this Document. It is the responsibility of the Contractor to provide all material necessary to provide a complete and operable system. If the contractor feels that the system described is incomplete they must address this in writing to the Owner/Owner's Representative before providing a bid.
- D. All questions concerning non specified product and services will be address to the Owner's Representative before Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that the Contractor has provided a competent bid for a complete solution.
- E. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 REGULATORY REFERENCES

- A. Contractor will comply will all Federal, State, Local Codes/Regulations and Industries Standards.
 - 1. Federal:
 - a. NFPA 70 - National Electrical Code (NEC).
 - b. FCC; Part 15 & Part 6A8.
 - 2. State of California:
 - a. CCR Part 2 - California Building Code.
 - b. CCR Part 3 - California Electrical Code.
 - c. Occupational Safety and Health Act (OSHA).
 - d. Title 24, Building Standards, State of California.
 - e. Title 19, California Code of Regulations.
 - f. Title 8, Electrical Safety, State of California.
 - 3. Industry Standards.
- B. Industry Standards: The following industry standards are the basis for the structured cabling system described in this document.

1. ANSI/TIA:
 - a. ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises, or most recent revision at the time of installation
 - b. ANSI/TIA-568-C.1 - Commercial Building Telecommunications Cabling Standards, or most recent revision at the time of installation
 - c. ANSI/TIA-568-C.2 - Balance Twisted Pair Communications and Components Standards, or most recent revision at the time of installation
 - d. ANSI/TIA-568-C.3 - Optical Fiber Cabling Components Standard
 - e. ANSI/TIA -942 -Telecommunications Infrastructure for Data Centers, or most recent revision at the time of installation
 - f. TIA-569-B - Commercial Building Standard for Telecom Pathways and Spaces, or most recent revision at the time of installation
 - g. ANSI/TIA-606-A - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, or most recent revision at the time of installation
 - h. ANSI-J-STD-607-A - Commercial Building Grounding/Bonding Requirements, or most recent revision at the time of installation
 - i. ANSI/TIA 1152 - Testing of Copper Links
2. National Electrical Codes:
 - a. National Electrical Safety Code (NESC) (IEEE C 2)
 - b. National Electrical Code (NEC) (NFPA 70)
3. ISO/IEC:
 - a. ISO 11801 - Generic Cabling for Customer Premises
4. OSHA Standards and Regulations – all applicable.
5. Local Codes and Standards – all applicable.
6. BICSI:
 - a. Telecommunications Distribution Methods Manual 12th Ed., or most recent revision at the time of installation.
 - b. Information Transport Systems Installation Methods Manual (ITSIMM), 5th Edition, or most recent revision at the time of installation. All parts unless otherwise required must be ROHS compliant.

C. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

D. This document does not replace any code, either partially or wholly. The contractor must be aware of and comply with all local codes that may impact this project.

1.4 QUALITY ASSURANCE

- A. Quality Assurance: Contractors wishing to provide a proposal for this project are required to comply with the following without exception:
 1. The winning Contractor will assign this project to a competent Project Manager who has demonstrated their ability to supervise a telecommunications project of the same size and scope.
 - a. The contractor will make this person available to the Owner/Owner's Representative before the start of this project for an interview. This person must be deemed acceptable by the Owner and/or their Representative before work can begin.
 - b. Project Manager will be required to be available for scheduled on site project meetings at no additional cost to the Owner.
 - c. Project Manager will be required to be available to meet on site with the Owner/Owner's representative with a minimum of 24 hours

- notice for non-emergency issues, and a minimum of 4 hours for emergency issues at no additional cost to the Owner.
2. All material and equipment to be installed on this project will be new. If the Owner/Owner's Representative discovers that "used" material or equipment has been installed on this project the Contractor will be required to replace said materials and/or equipment with "new" products at no additional cost to the Owner.
 - a. "New" - Materials and products manufactured within one (1) year prior to installation, and meet or exceed the latest published specifications of the manufacture. Also these materials and equipment may not have been in use before installation on this project unless directed otherwise in the project documents.
 3. Contractor will provide a minimum of a 25 year System Warranty as part of their bid price.
 4. Contractor must warranty all materials, equipment and labor not covered under the 25 Year Certification Plus Warranty for a minimum of one (1) year.
 - a. Warranty will provide repair/replacement of all defective or improperly installed materials at no additional cost to the Owner (including Labor, drive time, shipping, taxes, etc.).
 - b. Contractor is required to keep in stock replacement parts for all items covered in this specification and provide a competent service technician to be on site to repair/replace defective items no later than 24hours after receiving trouble call.
 - c. Warranty will cover normal Business hours, 8am – 5pm, Monday thru Friday. All calls received on a Friday or the day before a holiday will be held until the following regular business day.

1.5 SUBMITTAL DOCUMENTATION

- A. Submittals shall comply with the Summary of Work document located in the Project Manual.
- B. Submit under provisions of Section 27 00 00.
- C. Product Data: Submittals shall include all items called for in this section and manufacturer's cut sheets for the following:
 1. All wire and cable: To include patch cords, cross connect wire and cross connect cordage.
 2. All connectors and required tooling.
 3. All termination system components for each cable type.
 4. All ER and TR equipment frame types, hardware and LAN equipment.
 5. All grounding and surge suppression system components.
 6. All test equipment to be used for fiber and copper channels.

1.6 EQUIVALENT PRODUCTS

- A. All Products described and Part Numbers given in this Specification are those of Panduit unless otherwise noted.
- B. Approved Equals:
 1. Ortronics, Leviton & CommScope.

2. Contractors wishing to approve a system other than those specified in this document will be required to perform the following:
 - a. Provide System specifications and cutsheets for all system components for the proposed new system(s).
 - b. Provide an itemized comparison to each of the system functions as described in this specification. Include in that document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria: "exceeds"/"matches"/ "unequal".
- C. All other products than those specifically address in the bid document that the Contractor is seeking approvals for must be *received* by the Owner's Representative *no later than 10 days before the bid date*. All Approved Equals will be published in addendum form prior to the bid date.
- D. Failure to received written approval for product installed that deviates from the products called for in this specification and/or on the project drawings will result in the contractor having to replace the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.
- E. All proposed system documentation must be sent to the Owner's Representative via one of the following; mail, fax or email. The Contractor will include the project name, their contact information, and the specification section number that the proposed system is comparable to.

Infinity Communications and Consulting, Inc.
P.O. Box 999
Bakersfield, Ca. 93302
(661) 716-1840 Phone
(661) 716-1841 Fax
p2bids@infinitycomm.com Email

PART 2 - PRODUCTS

2.1 WORK AREA SUBSYSTEM

- A. The Work Area shall consist of the connectivity equipment used to connect the horizontal cabling subsystem and the equipment in the work area. The connectivity equipment shall include the following options:
 1. Patch Cords.
 2. Modular Inserts and Jacks.
 3. Faceplates.
- B. Patch Cords:
 1. Category 6 Data/Voice Outlet Patch Cords:
 - a. All category 6 channel patch cords shall be constructed with a snagless boot, made of molded PVC, colored matched to the color of the patch cord cable.
 - b. All category 6 channel patch cords shall be constructed with category 6 patch cable, 24 AWG, 7/32 tinned copper stranded patch cable, insulated with polyethylene and paired, jacketed with PVC, ETL Verified for ISO 11801, (UL) NEC type CM or CMR, 75° C, Article 800 CSA Type CMG.
 - c. All category 6 channel patch cords shall be 100% factory tested to pass return loss (RL) and near-end cross talk (NEXT).
 - d. All category 6 channel patch cords shall be manufactured using a T568-B plug-wiring format.

- e. All patch cords will be delivered to the site and must be signed for by the Owner/Owner's Representative. It will be the responsibility of other to install all Work Area Data Patch Cords.
- f. Patch cords will be at least 16 feet long.
- g. Color: Data Patch Cords will be BLUE.
- h. Quantity: Contractor will provide one patch cord for every outlet cable shown on the drawings.
- i. Part#: UTPSP20BUY

C. Modular Inserts and Jacks:

- 1. Category 6 Data/Voice Jack:
 - a. Jack will meet the Category 6 Standard.
 - b. Jacks shall be 8 position un-keyed
 - c. Each jack shall be an individually constructed unit and shall snap mount in an industry standard keystone opening (.760" x 580")
 - d. Jacks shall utilize a 2 layer printed circuit board to control NEXT
 - e. Jack termination shall follow the industry standard 110 IDC.
 - f. Jacks shall have a designation indicating Category 6 on the nose which can be plainly seen from the front of the faceplate. Bottom of jack shall have date code and a abbreviated catalog number.
 - g. Jacks shall utilize a paired punch down sequence. Cable pair twists shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.
 - h. Jacks shall terminate 22-26 AWG stranded or solid conductors.
 - i. Jacks shall be compatible with single conductor 110 impact termination tools.
 - j. Jacks shall be compatible with TIA/EIA 606 color code labeling
 - k. Jacks shall have universal wiring designation.
 - l. Jacks shall have an attached color coded wiring instruction label housed between the IDC termination towers.
 - m. Jacks shall be manufactured in the USA
 - n. Jacks will be terminated according to the T568B wiring scheme.
 - o. Color:
 - 1) Data Jacks will be BLUE.
 - 2) Voice Jacks will be WHITE.
 - p. Quantity: Contractor will provide one jack for every outlet cable shown on the drawings.
 - q. Part#:
 - 1) Data Jack, CJ688TGBU.
 - 2) Voice Jack, CJ688TGWH.
- 2. Blank Insert:
 - a. Color: Blank Insert to be WHITE.
 - b. Quantity: Contractor will provide one insert for every video outlet cable shown on the drawings.
 - a. Panduit Part#: CMBWH-X.

D. Wall Mount and Modular Furniture Faceplates:

- 1. Voice/Data/Video Wall Plates:
 - a. Faceplates shall be UL Listed and CSA Certified.
 - b. Faceplates shall be 2.75" W x 4.5" H (6A9.8 mm x 114.3 mm).
 - c. Faceplates shall provide for TIA/EIA 606 compliant station labeling.
 - d. Faceplates shall have plastic covers over the mounting screws that can be replaced with a clear plastic window over a printable paper insert.
 - b. Color: Faceplate to be WHITE.
 - c. Quantity: Contractor will provide one single gang faceplate for each outlet shown on the drawings.

Part Number	Description
UICFP2WH	Single gang, vertical faceplate holds up to two Mini-Com Modules
UICFP4WH	Single gang, vertical faceplate holds up to four Mini-Com Modules
UICFP6WH	Single gang, vertical faceplate holds up to six Mini-Com Modules. Requires min. 1.9" wide in-wall box or wallboard adapter for proper installation

2. Blank Wall Plates:
 - a. Faceplate shall be constructed from stainless steel.
 - b. Faceplates shall be UL Listed and CSA Certified
 - c. Faceplates shall be 2.75" W x 4.5" H (6A9.8 mm x 114.3 mm) for single gang.
 - d. Color: Faceplate to be STAINLESS STEEL
 - b. Quantity: Contractor will provide one faceplate for each unused data/voice/video/intercom outlet shown on the drawings.
 - c. Part#: Equal to Hubbell Wiring Device, PN# S13
3. Surface Mount Raceway Insert: Inserts for Wiremold's 4050, 5450 and 5550 Device Mounting Brackets:
 - a. Insert shall allow for two category 6 jacks to be mounted flush.
 - b. Insert shall match the color of the Raceway installed.
 - c. Color: Faceplate to be IVORY
 - d. Quantity: Contractor will provide one 2port insert for each outlet in the Surface Mount Raceway shown on the drawings.
 - a. Part#: Equal to Wiremold, PN# 5507FRJ.

2.2 HORIZONTAL DISTRIBUTION CABLING

- A. The horizontal distribution cabling system is the portion of the telecommunications cabling system that extends from the Work Area (WA) telecommunications outlet/connector to the horizontal cross-connect in the Telecommunications Room
 1. Cabling Support System
 2. Copper Station Cabling
 3. Copper Cross-Connect Cabling
- B. Cabling Support System:
 1. See drawing plans and paragraph 2.4.F
- C. Copper Station Cable:
 1. Category 6 Data/Voice Copper Unshielded Twisted Pair (UTP) Cable:
 - a. Cable will meet or exceed the proposed requirements of ANSI/TIA/EIA 568-B.2, 568-C.2 and ISO/IEC 11801 Category 6 Cable Standard for: NEXT and ELFEXT (Pair-To-Pair and Power Sum), Insertion Loss (Attenuation), Return Loss, and Delay Skew.
 - b. Cable shall be proven to support Gigabit Ethernet / 1000BASE-T / IEEE 802.3ab, ATM up to 155 Mbps, IEEE 802.3af Power Over Ethernet for VoIP, 100 Mbps Fast Ethernet / 100BASE-T / IEEE 802.3, ANSI.X3.263 FDDI TP-PMD, Ethernet / 10BASE-T / IEEE 802.3, 4 & 16 Mbps Token Ring / IEEE 802.5, T1/E1, xDSL, ISDN, 550 MHz Broadband Video and standards under development such as ATM at 622 Mbps, 1.2 and 2.4 Gbps.
 - c. The cable shall consist of four unshielded twisted pairs of thermoplastic insulated bare copper enclosed in a thermoplastic jacket.

- d. All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one floor.
- e. Cable shall have been certified with the UL 1666 Vertical Tray Flame Test.
- f. Cable shall be available in a Plenum, Riser and Indoor/Outdoor rated jackets.
- g. Contractor will use the indoor/outdoor rated cable for all locations where the cable pathway goes underground and/or run in exterior conduit.
- h. The listed Category 6 cables in this specification are manufactured by General. All other manufactures eligible for Panduit's *Certification Plus* also have been pre-approved.
- i. Color:
 - 1) Data cable jacket will be BLUE
 - 2) Voice cable jacket will be WHITE
- j. Quantity: See Drawing for quantity and installation details.
- k. Part#:
 - 1) For Riser Application:
 - a) Data, General PN# 7133764.
 - b) Voice, General PN# 7133765.
 - 2) For Plenum Application:
 - a) Data, General PN# 7131760.
 - b) Voice, General PN# 7131761.
 - 3) For Outdoor Application:
 - a) Data/Voice/S-Video, General PN# 7136100 (all cable jackets will be BLACK).

D. Horizontal Copper Cross-Connect Cabling:

- 1. Data Cross-Connect Cabling
 - a. Cable shall meet and/or exceed the UL Listed Type CMR and the ANSI/TIA/EIA 568C.1 standard for Category 6 compliance.
 - b. Core Construction
 - 1) Conductors: Solid-copper conductors, 23 AWG.
 - 2) Insulation: Polyolefin.
 - c. Jacket: Gray, Non-Plenum PVC jacket.
 - d. Color: Data cable jacket will be GRAY.
 - e. Quantity: Will be equal to the number of jacks installed.
 - f. Part#: Equal to General Cable, PN# 7133821.
- 2. Voice Cross-Connect Cabling:
 - a. Cable shall meet and/or exceed the UL Listed Type CMR and the ANSI/ICEA S-80-576A standard.
 - b. Core Construction:
 - 1) Conductors: Solid-copper conductors, 24 AWG.
 - 2) Insulation: Flame retardant semi-rigid PVC.
 - 3) Core Assembly: Cable core will be made up of 100 pair units consisting of four (4) 25 pair sub-units. Each group individually identifiable by color coded unit binders.
 - c. Jacket: Gray, flame retardant PVC jacket.
 - d. Color: Voice cable jacket will be GRAY
 - e. Quantity: See Drawing for quantity and installation details. The number of 25-pair cable between the MDF and the IDF shall be derived by multiplying the number of pairs required for the cross-connect by 1.25 to the nearest 25-pair increment.
 - f. Part#: Equal to General Cable:
 - 1) 25 pair = PN# 6A97006A5.

- 2) 50 pair = PN# 6A970123.
- 3) 75 pair = PN# 7002975.
- 4) 100 pair = PN# 700296A7.

2.3 BACKBONE CABLING

- A. The backbone cabling system is the portion of the telecommunications cabling system that extends from the Intermediate Distribution Frame (IDF) to the Main Distribution Frame (MDF).
 1. Fiber Optic Backbone Cabling are existing.
 2. Copper Backbone Cabling are existing.
- B. Copper System Backbone Cabling:
 1. Voice/Intercom/Bell System Backbone Cabling are existing to remain.

2.4 TELECOMMUNICATION ROOM

- A. The Telecommunication Room (TR) includes those products that terminate horizontal and backbone cabling subsystems and connect then to the network equipment.
 1. Patch Cords.
 2. Horizontal Cabling Termination Equipment.
 3. Backbone Cabling Termination Equipment.
 4. Cabinets, Racks, and Enclosures.
 5. Cable Support System.
 6. Grounding and Bonding Equipment.
- B. Patch Cords:
 1. Copper Patch Cords: Category 6 Data/Voice TR Patch Cords:
 - a. TR Copper Patch Cords shall comply with those specified in *2.1 Work Area Subsystem, A. Patch Cords, 1. Category 6 Data Outlet Patch Cords.*
 - b. *All patch cords will be delivered to the site and must be signed for by the Owner/Owner's Representative. It will be the responsibility of other to install all TR Data and Voice Patch Cords.*
 - c. Color:
 - 1) Data Patch Cords will be BLUE
 - 2) Voice Patch Cords will be WHITE
 - d. Quantity: Contractor will provide one patch cord for every data and voice outlet cable shown on the drawings. Contractor will provide the quantity of different length patch cords as follows:
For the HC's, Contractor will provide:
 - 1) All patch cords will be 3ft.
 - e. Part#:
 - 1) Data Patch Cords: 3 foot Data Patch Cord, UTPSP3BUY.
 - 2) Voice Patch Cords: 3 foot Voice Patch Cord, UTPSP3BUY.
 2. Fiber Patch Cords: Fiber Optic TR Patch Cords:
 - a. Patch Cords shall be a Duplex SC to SC 50/125µm "Laser Optimize" Graded-Index Multimode Fiber Patch Cord.
 - b. All patch cords shall be factory polished and 100% optically tested for superior performance.
 - c. Cables shall have a Mated Pair MM Insertion Loss of less than 0.6A0 dB (0.25 dB Typical).
 - d. Cable Retention: > 25 pounds
 - e. All optical, mechanical and environmental performance shall meet and/or exceed the TIAEIA-56A8-C.3 specifications.
 - f. Fiber patch cords will be 1 meter long.

- g. Color: NA.
- b. Quantity: Contractor will provide two fiber patch cords for every TR shown on the drawings.

Panduit Part Number	Description
FXD3-3M1Y	SC to SC multimode duplex patch cord, 3mm jacketed cable (one duplex SC connector on each end) – 10Gig™ 50/125µm.

C. Horizontal Cable Termination Equipment:

1. Copper Termination Equipment: Data/Voice Category 6 Patch Panels:

- a. Panels shall be made of black anodized aluminum in 24, 48, and 96 port configurations.
- b. Panels shall have modular jacks employing a tri-plane staggered contact array with a flat “hairpin” contact design made of Beryllium copper with a minimum 50-micro-inch gold plating on contact surfaces over 50-100 micro-inch of nickel compliant with FCC part 68.
- c. Panels shall be equipped with 110-style termination made of fire retardant UL 94V0 rated thermoplastic and tin lead solder plated IDC.
- d. Panels shall have optional rear cable support bar for strain relief. Cable support bar shall attach to the rear of the patch panel itself without the use of additional fasteners or screws.
- e. Panels shall have self-adhesive, clear label holders and white designation labels provided with the panel for each row of 24 ports.
- f. Panels shall provide wiring identification & color code and maintain an in-line, paired punch down sequence that does not require the splitting of conductors from individual cable pairs.
- g. Panels shall terminate 22-26 AWG solid conductors, maximum insulated conductor outside diameter 0.050”.
- h. Panels shall be ANSI/TIA/EIA-568-C.1, C.2 and ISO/IEC 11801 category 6 compliant.
- i. Panels shall be UL LISTED 1863 and CSA certified.
- j. Panels shall be made by an ISO 9002 Certified Manufacturer.
- k. Panels installed in a 4-connector channel with a category 6 modular jack, and category 6 patch cords, all from the same manufacturer, and a qualified category 6 cables shall meet or exceed the requirements of Draft 5 of the TIA UTP Systems Task Group PN3727, Category 6 Draft Addendum to the ANSI/TIA/EIA-568-C.2 standard.
- l. Color: Patch Panel shall be BLACK.
- m. Quantity: See Drawing for quantity and installation details. The number of patch panels to be supplied shall be derived by multiplying the number of data/voice cables being terminated at the individual TR by 1.25 and providing additional panels in the nearest 24 port increment.
- n. Part#:
 - 1) 24 port Category 6 Patch Panel, DP24688TGY.
 - 2) 48 port Category 6 Patch Panel, DP24688TGY.

**Provide one Cable Management Bar, PN# CMPHF2, for each patch panel.*

2. Copper Termination Panels:

- a. Voice/Intercom 110 Wiring Blocks:
 - 1) Blocks shall be available in a 300 pair unit.
 - 2) Blocks shall be wall mounted.

- 3) Wiring blocks shall be available as kits that include the wiring blocks, the proper number of 5 pair connecting clips, wire management and label strips.
- 4) Blocks shall be constructed of a UL94 V0 rated polycarbonate blend.
- 5) Blocks shall be mounted to a rugged 16 ga steel distribution frame. Frame shall support the 110 blocks and allow for a through for cables to be routed through the rear of the blocks directly to the termination point.
- 6) Blocks shall be UL VERIFIED for TIA/EIA-568-C compliance.
- 7) Color: NA
- 8) Quantity: See Drawing for quantity and installation details. The number of 110 blocks to be supplied shall be derived by multiplying the number of voice/intercom cables being terminated at the individual TR by 1.25 and providing additional panels in the nearest 300 pair block increment.

Panduit Part Number	Description
P110B1004R4WJY	Two 100-pair bases and jumper troughs premounted to 19" rack mount panel. 4-pair connector kit included with five 4-pair connectors and one 5-pair connector per row of 25 pairs.

3. OSP Protection Panels:
 - a. 110 connector input and output.
 - b. Wall or frame mountable.
 - c. Designed with an internal splice chamber and cover over incoming and outgoing connections and protection modules.
 - d. Stackable to allow for future service expansion.
 - e. Equipped with an internal fuse link.
 - f. External ground connectors accept 6-14 AWG ground wire.
 - g. Accommodates industry standard 5 pin protection modules.
 - h. Designed to exceed the requirements set forth in Underwriters Laboratory's UL497.
 - i. Color: NA
 - j. Quantity: See Drawing for quantity and installation details.
 - k. Part#: Circa Enterprise Inc.
25 pair block, PN# 1880ECA1-25
50 pair block, PN# 1880ECA1-50
100 pair block, PN# 1880ECA1-100
4. OSP Protection Fuses:
 - a. 75VDC (RUS Approved).
 - b. Nanosecond response time.
 - c. External failsafe mechanism that permanently carbon arrestors grounds the module under sustained high current conditions.
 - d. Integrated Test Points.
 - e. UL & cUL listed.
 - f. Designed to meet or exceed Telcordia standards.
 - g. ISO 9002 Certified Manufacturer.
 - h. Color: RED.
 - i. Quantity: See Drawing for quantity and installation details.
 - j. Part#: Circa Enterprise inc. 4B3S-75:
**Provide 100% fuse density for all installed Protection Panels.*
- D. Cable Support System:
 1. Ladder Rack Cable Runway:
 - a. Stringers shall be fabricated from 16Aga 0.375" x 1.5" Cold Rolled Steel tubing.

- a. Rungs shall be fabricated from 16Aga 0.5" x 1.0" Cold Rolled Steel tubing.
- b. Rungs shall be spaced at 9.0" center to center.
- c. A straight length of ladder shall be capable of supporting 45 pounds per foot when a 10' length is tested according to NEMA VE-1.
- d. Ladder Rack shall have a powder coat finished.
- e. Ladder Rack shall be available in standard 6ft. and 10ft. lengths.
- f. Ladder rack shall be a part of a total system that includes: manufacture bends, wall supports, joining hardware, etc.
- g. Ladder Rack shall be grounding per the TIA/EIA 6A07-A.
- h. Color: Ladder Rack will be BLACK.
- i. Quantity: See Drawing for quantity and installation details.
- j. Part #: Equal to Chatsworth Products Cable Raceway, PN# 11252-71X.

E. Firestop System:

- 1. See project drawings for detailed fire caulk systems and products.
- 2. Intumescent fire caulk:
 - a. The firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure.
 - b. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
 - c. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall use the proper firestop equipment.
 - d. Firestop systems shall be UL Classified to ASTM E814 (UL 1479).
 - e. Approved Fire Barrier/Caulk – 3M Fire Barrier CP25 or equal STI, PN# SSS100.

F. Re-Enterable Fire Stop System:

- 1. See project drawings for detailed fire thru systems and products.
 - a. The re-enterable fire stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure.
 - b. No additional fire stopping material shall be required to obtain proper fire stopping.
 - c. The system shall offer full fire resistance whether it is empty or 100% visually filled.
 - d. The system shall be self-contained, and shall automatically adjust to differing cable loads.
 - e. The system shall allow add, moves, and changes without additional materials.
 - f. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate re-enterable fire stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall use the proper fire stop equipment.
 - g. Fire stop systems shall be UL Classified to ASTM E814 (UL 1479).
 - h. The system shall be gang-able using wall plates for additional capacity.
 - i. Quantity: See Drawing for quantity and installation details.

- j. Part #: Equal to STI
 - 1) STI PN# EZDP33FWS.
 - 2) STI PN# EZDP33WR.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Work Area Outlets Installation:
 - 1. No more than 12" of cable shall be stored in an outlet box, modular furniture raceway, or insulated walls.
 - 2. Bend radius of the cable in the termination area shall not be less than 4 times the outside diameter of the cable. 1/2 inch) of the termination point.
 - 3. All UTP cables shall have no more than 12.7mm (1/2 inch) of pair *untwisted* at the termination point.
 - 4. Data jacks, unless otherwise noted in drawings, shall be located in the top position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the left-most position(s).
 - 5. Voice jacks, unless otherwise noted in drawings, shall occupy the next position(s) below the data on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the position left of the data jack.
 - 6. Video jacks, unless otherwise noted in drawings, shall occupy the bottom position(s) on the faceplate. Video jacks in horizontally oriented faceplates shall occupy the position left of the data/voice jack.
 - 7. All faceplates installed shall be level.
 - 8. All outlets will be labeled according to the approved labeling scheme.
 - 9. Each faceplate shall be machine labeled. The labeling shall be placed on the faceplate so that the individual jack can be clearly identified by its associated label.
 - 10. Cables shall be identified by a self-adhesive label in accordance with the Identification and Labeling section of this specification and ANSI/TIA/EIA-606A. The cable label shall be applied to the cable no further than 6" behind termination module, behind the faceplate on a section of cable that can be accessed by removing the cover plate.
- B. Horizontal Distribution Cable Installation:
 - 1. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
 - 2. Tie Wraps will not be allowed for supporting, bundling and/or dressing of any station cables on this project.
 - 3. Contractor will provide a three foot "service loop" for all station cables. The service loop will be coiled and secured using Velcro in the accessible ceiling at the conduit stub to the work area outlet box.
 - 4. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in all "common" conduit runs. "Common" Conduit Runs are those that house more than one cable or set of cables that do not specifically feed a Work Station Outlet. Examples of "Common" Conduit Runs are: floor/ceiling penetrations, stub-throughs, distribution conduits, all conduits between J-boxes, etc.
 - 5. Cable raceways shall not be filled greater than the TIA/EIA-56A9-A maximum fill for the particular raceway type or 40%.
 - 6. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
 - 7. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
 - 8. Pulling tension on 4-pair UTP cables shall not exceed 25-lb for a four-pair UTP cable.

9. The Cable Support System shall be installed in such away that will allow for future cables to be added and to provide sufficient protection of all cable.
10. For all installs where station cables are not installed in a continuous conduit run the following guidelines will apply. The Contractor will be responsible to reinstall all cables and pathways that do not meet with the following at no additional cost to the Owner:
11. J-hooks shall be installed to support all station cables every 4ft to 5ft.
12. All pathways shall be run at right angles. No diagonal pathways will be allowed unless otherwise noted on the drawings.
13. Horizontal cables shall be bundled in groups of no more than 25 cables per Caddy's CAT21 J-hook, no more than 40 cables per Caddy's CAT32 J-hook, and no more than 6A4 cables per Caddy's CAT6A4 J-hook.
14. At no point shall cable(s) rest on acoustic ceiling grids, acoustic panels, or lighting fixtures.
15. All cables will be installed so that there is a minimum of 3" of clearance above all ceiling grid and tiles.
16. All cables will be installed so that there is a minimum of 12" of clearance above all florescent lighting.
17. All cables will be installed so that there is a minimum of 6A" of clearance from all fire alarm and electrical system conduits.
18. Cables shall not be attached to the ceiling grid or lighting fixture wires. The contractor will provide their own carriers wires to support their horizontal cabling.
19. All cables shall be installed above fire-sprinkler systems and plumbing system fixtures and devises. Cables shall not be attached to or supported by these fixtures and/or their ancillary equipment or hardware.
20. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
21. Contractor is responsible for sealing around all cables that penetrate fire rated barriers.
22. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

C. Horizontal Cross-Connect Installation:

1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-A standard, manufacturer's recommendations and best industry practices.
2. The cable jacket shall be maintained to within 12.7mm (1/2 inch) of the termination point.
3. All UTP cables shall have no more than 12.7mm (1/2 inch) of pair *untwist* at the termination point.
4. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
5. All cables shall be neatly bundled and dressed continuously from the entrance point of the Telecommunications Room to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame. Contractor will use Velcro strip to bundle cables together. The use of Tie – Wraps is not permitted.
6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

D. Backbone Cable Installation:

1. Backbone cables shall be installed separately from horizontal distribution cables.

2. Where possible the backbone and horizontal cables shall be installed in separate conduits.
3. Where possible backbone cables of the same type shall be combined in conduit runs to maximize conduit fill ratios.
4. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
5. Pulling tension on Backbone cables shall not exceed the manufacture's limitations.
6. The minimum bend radius for all Backbone cables is 16 times the cable diameter or the manufactures specification, which ever is greater.
7. All OSP cables may not penetrate more than 50ft into the buildings before be terminated or splices to cable with a fire resistant jacket, unless the jacket is indoor/outdoor rated.
8. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
9. All backbone cables shall be securely fastened to the sidewall of the TR on each floor.
10. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
11. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
12. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

E. Backbone Cross-Connect Installation:

1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-A document, manufacturer's recommendations and best industry practices.
2. Bend radius of the cable in the termination area shall not exceed 16A times the outside diameter of the cable.
3. All cables shall be neatly bundled and dressed continuously from the entrance point of the Telecommunications Room to their respective panels or blocks.
4. Contractor will provide a minimum of a 3 foot "service loop" for each backbone cable before terminating to allow future rearrangement. Cables will be coiled and secured above the ceiling where possible or to the Telco Backboard where entrance point is from the floor.
5. Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.
6. Contractor shall provide a machine label 1ft. to 2ft. from the entrance point of the TR and 6in. to 12in. from the termination point on each backbone cable. Cable shall be easily identified and fully legible without removing the bundle support ties.

F. Cabinets, Racks, Enclosures and Ladder Rack Installation:

1. Wall Mount Racks/Cabinets shall be securely attached to the Telco Backboard using minimum 5/16" hardware or as required by local codes.
2. Floor Mount Racks/Cabinets shall be securely attached to the concrete floor using minimum 3/8" drop-in anchor hardware or as required by local codes.
3. All Floor Mount Racks/Cabinets will be either; secured on one side to the wall or attached to the closest wall with ladder rack.
4. All Racks/Cabinets shall be braced to meet Zone 4 seismic requirements.
5. Contractor will maintain a minimum of 36 inches of clearance from the front of the all rack/cabinets and all other obstructions.
6. Floor Mount Racks/Cabinets shall be installed to allow for a minimum of 36A" from rear and all other obstructions.
7. All racks shall be grounded to the telecommunications ground bus bar.

8. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
 9. The plywood bottom edge shall be mounted vertically no less than 12" above the finished floor.
 10. Contractor will provide all cutouts for the Electrical Contractors expansion rings and electric receptacles as shown on the drawings.
 11. Ladder Rack must be securely attached to walls, backboards, and racks/cabinets to comply with all Zone 4 seismic requirements.
 12. Ladder rack shall be installed so that there is a minimum of 8" of unobstructed clearance above rack.
 13. Ladder Rack shall be installed so that there is a minimum of 12" of clearance from all: florescent lighting, electrical conduits/circuits, and fire alarm conduits/devices.
- G. Firestop System:
1. The firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure.
 2. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
 3. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall use the proper firestop equipment.
 4. Firestop systems shall be UL Classified to ASTM E814 (UL 1479).

3.2 IDENTIFICATION AND LABELING

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor.
- B. The approved system will comply with the TIA/EIA -606-A Class 2 designations and include at a minimum, identifiers for all major components of the system: telecommunication rooms, grounding bus bars, racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.
- C. All label printing will be machine generated or hand-held printers using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.
- D. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

3.3 TESTING AND ACCEPTANCE

- A. General:
 1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-A Addendum 5, TSB-67 and TSB-95. All pairs of each installed cable shall be verified prior

to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Manufacturer's Warranty guidelines and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
3. Contractor will notify the Owner/Owner's Representative 72 hours before commencement of testing.
4. Upon receipt of the test documentation, the Customer reserves the right to have the contractor perform a 10% witnessed "spot testing" of the cabling system to validate test results provided in the test document, at no additional cost. If a significant amount of cables are marginal and/or fail during the "spot test" Contractor will retest the entire cable plant at no additional cost.

B. Copper Cable Testing:

1. Twisted Pair Cable:

- a. All twisted-pair copper cable links (including backbone cables) shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below.
- b. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
- c. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-A Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

2. Category 6 Performance:

- a. Follow the Standards requirements established in:
 - 1) ANSI/TIA/EIA-568-A -TSB-67:
 - a) Wire Map.
 - b) Length.
 - c) Attenuation.
 - d) NEXT (Near end crosstalk).
 - 2) ANSI/TIA/EIA-568-A -TSB-95:
 - a) Return Loss.
 - b) ELFEXT Loss.
 - c) Propagation Delay.
 - d) Delay skew.
 - 3) ANSI/TIA/EIA-568-A, Amendment 5:
 - a) PSNEXT (Power sum near-end crosstalk loss).
 - b) PSELFEXT (Power sum equal level far-end crosstalk loss)
- b. A Level III or better test unit is required to verify category 6 performances and must be updated to include the requirements of

TSB-95 and Amendment 5. Testers will be equal to Fluke Network's DXT CableAnalyzer™ Series.

- c. All testers shall have been recalibrated with 6 months of use on this project. Contractor will be asked to provide proof of recalibration.
- d. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard, and the result shown as pass/fail. The approved Level Three tester shall provide a printed document for each test that is also available in a downloadable file using an application from the test equipment manufacturer. The printed test results shall include a print out of all tests performed, and the individual test results for each cable.

3.4 SYSTEM CLOSEOUT AND AS BUILT DOCUMENTATION

- A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Owner's Representative/Engineer for approval. One (1) to be a hardcopy and two (2) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 calendar days of the completion of each testing phase. At the request of the Owner's Representative/Engineer, the telecommunications contractor shall provide copies of the original test results.
- C. The Owner's Representative/Engineer will request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.
- D. Test Results documentation shall be provided in two media, as listed above, one (1) hardcopy and one (1) on disk within three weeks after the completion of the project. The documentation shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an bi-annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- E. Printouts generated for each cable by the wire test instrument shall be submitted as part of the documentation package.
- F. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
- G. The As-Built drawings are to include cable routes, outlet locations and the approved labeling identifiers. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD 2008) formats on which as-built

construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

- H. Contractor will provide one laminated 11"x17" drawing at each Telecommunications Room (TR) that includes the building layout for that HC/MC, along with the outlet locations and all of the approved labeling.

END OF SECTION

09/21/18

SECTION 27 51 23

INTERCOM AND CLOCK SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to the General Conditions and all other Section of Division 27.

1.2 DESCRIPTION OF WORK

- A. Furnish and install all labor, materials, equipment, tools, transportation, supervision, services required to provide and leave ready for operation a new Bogen Quantum Multicom IP Clock and Public Address system. The contractor shall include all materials and/or equipment necessary to make a complete working installation. The electrical work shall include, but is not limited to the following:
 - 1. Public address speakers, clocks, head end equipment, wiring and connections as indicated on drawings to establish a new fully functional integrated system.
- B. Related work included in other Sections:
 - 1. Basic Construction Materials and Methods: Section 26 05 00.
 - 2. Grounding: Section 26 05 26.
 - 3. Complete installation and wiring of each device. The systems shall include conduit, outlet boxes, wiring devices, signaling facilities, programming, staff training and other items as specified.
 - 4. Provide all incidental work and materials involved in installation of the signal equipment including carpentry or structural work for support of junction boxes, conduits, control panels, outlets, etc.

1.3 SUPERVISION AND QUALITY OF WORK

- A. The Contractor shall supervise the work of this section, personally, or through an authorized and competent representative.
- B. All material and equipment shall be installed in a neat manner. Any material or equipment not installed in the manner described shall upon the order of the Architect, Engineer or District be removed and replaced in satisfactory manner. No additional expense shall be allowed to repair work required.
- C. The Contractor shall carefully study and compare all drawings, specifications and other instructions and shall at once report, prior to bid, to the Engineer via the Architect any error, inconsistency or omission that may be discovered.

1.4 CONTRACTOR

- A. The contractor shall furnish all equipment, accessories and material required for the installation of a comprehensive communication system in strict compliance with these specifications and applicable contract drawings. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this specification.

1.5 MANUFACTURER

- A. The manufacturer shall be a United States manufacturer, who has been regularly engaged in the manufacture of communication systems for at least thirty (30) years.

The equipment described herein, and furnished per these specifications shall be the product of one manufacturer. All reference to model numbers and other detailed descriptive data is intended to establish standards of design, performance and quality, as required. Equipment manufactured by Bogen Communications, Inc. shall be acceptable and shall be installed by Sound and Signal, Inc. the Authorized Bogen Distributor of Engineered Sound Products for this region. They can be reached at 925-455-1778 or WWW.SoundandSignal.com

- B. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as E.T.L., D.S. & G., or UL and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, including NEC Section 800-51 (i), under direction of a qualified and factory approved distributor, to the approval of the owner.
- C. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory keyed plugs designed for fault-free connection. The printed circuit card of the card cage shall be silk screened to indicate the location of each connection.

1.6 SUBMITTALS AND SUBSTITUTIONS

- A. Within thirty-five (35) calendar days after the date of award of the contract, the contractor shall submit to the Architect for review, eight (8) copies of a complete submission. The submission shall consist of five (5) major sections, with each section separated with insertable index tabs. The first section shall be the "index", which shall include the project title and address, name of the firm submitting the proposal and the name of the Architect. Each page in the submission shall be numbered chronologically and shall be summarized in the index. The second section shall include a copy of the authorized distributor's valid C-10 California State Contractors License, letters of factory authorization and guaranteed service, list of projects of equal scope and list of proposed instrumentation to be used by the contractor. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications. The fifth section shall contain a wiring destination schedule for each circuit leaving each piece of equipment.
- B. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.
- C. In order to establish quality and standards of performance of equipment required by the Owner, the specified equipment for the communication systems is that of Bogen Communications, Inc. All mechanical, electrical and general information set forth on the respective data sheets for each specified item shall be considered as part of these Specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Architect reserves the right to require a complete sample tested by an independent testing laboratory to prove equality. The decision of the Architect regarding equality of proposed equal items will be final. All base bids must be submitted using the Bogen Communications, Inc. product.
- D. All parties understand that any substitution(s) of specified products are done for the purpose of cost savings to the Owner. Therefore, any material substitutions or deviations proposed by the Contractor shall be included with the initial bid and shall show a line item credit to the Owner for each item substituted in lieu of specified products.

1.7 QUALIFICATIONS

- A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
- B. As further qualification for bidding and participating in the work under this specification the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of California. The manufacturer's representative shall have completed at least fifty (50) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least twenty (20) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

1.8 EQUIPMENT WARRANTY

- A. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of two (2) years after final acceptance of the project by the owner.

1.9 SERVICE FACILITIES

- A. The contractor shall make available, and maintain a satisfactory service department capable of furnishing equipment inspection and service. The contractor shall be prepared to offer a service contract for the maintenance of the system beyond the warranty period.

1.10 TRAINING

- A. The contractor shall instruct personnel designated by the owner in the proper use, basic care, and maintenance of the equipment. Such training shall be provided as an integral component of the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements specifications, provide the following system:
 - 1. Quantum Multicom IP manufactured by Bogen Communications, Inc., Ramsey, NJ
- B. The Specifying authority must approve any alternate system.
- C. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- D. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.2 SYSTEM PARAMETERS

- A. The communication system shall be a Bogen Quantum Multicom IP, and shall provide a comprehensive communication network between administrative areas and staff locations throughout the facility. Nonvolatile memory shall store permanent memory and field-programmable memory. A system, which uses a battery to maintain system configuration information, shall not be acceptable.

The system shall provide no less than the following features and functions:

1. Telephonic communication (complete with DTMF signaling, dial tone, ringing and busy signals, and data display) on administrative stations shall use two wires. Systems that use more than two wires for communication, tones and data display shall not be acceptable.
2. Amplified-voice communication with loudspeakers shall use a shielded audio pair (shield can be used as one of the two required conductors for administrative phone or call-in switch).
3. The system shall be available in the following configurations:
 - a. MC2K Wall-mounted in a custom enclosure. Station capacity shall be from 24 to 130 stations. All stations shall have the ability to support displays.
 - b. MC2KR Rack-mounted. Station capacity shall be from 24 to 250 stations. All telephone stations shall have the ability to support displays.
 - c. QRC24 & QRC48 Compact Quantum Rack System. Station capacity shall be from 24 to 48 stations. All stations shall have the ability to support displays, with an option to add up to 8 Central Office phone lines.
 - d. 2223/2233 MC2KR Rack-mounted and integrated with Bogen Multi-Graphic Series 2223 or Series 2233 equipment. In this configuration, Quantum Multicom IP system station capacity shall be expandable up to 250 stations in increments of 24. All telephone stations shall have the ability to support displays. The Multi-Graphic system equipment provides the following: backup fail safe intercom and paging functions (Note: the systems operate independently; if one were to fail, the other provides intercom for student safety), plus two additional program channels, and additional Multi-Graphic functions. It shall be possible, by use of a separate call-in switch, to annunciate only to the Multi-Graphic portion of the system without using additional station ports within the Quantum Multicom IP system.

The above system configurations represent a single processor in the Quantum Multicom IP. Each processor can be combined with up to 63 additional systems (nodes) for a total single facility capacity of up to 16,000 stations. Up to 99 additional facilities can communicate with each other to provide district-wide point-to-point calling and All-Call Paging with up to 1,600,000 stations.

4. The system shall consist of any combination of the following: Administrative Display Phones, Administrative VoIP Phones, and Administrative Phones.
 - a. Staff Classroom Stations shall consist of wall- or ceiling-mounted loudspeakers with call-in switches or handsets.
 - b. Administrative phone stations shall consist of either VoIP phones, display phones, or DTMF dialing 2500 analog-style telephone sets.
 - c. Administrative Display Phones shall be DTMF-dialing digital telephone sets with a 4x16 character LCD display panel. They shall be equipped with a standard 12-key push-button dialing keypad. Phones requiring external LCD displays

shall not be accepted as an equal. Optionally, a loudspeaker may be connected at each administrative station location.

- 1) Up to 5 Administrative Wall Displays may be added to the Administrative Station for large office areas.
- d. Administrative Display Phones and Administrative Phones shall have the option of including a loudspeaker.
- e. All types of stations except administrative VoIP phones shall utilize the same type of field wiring. Future station alterations shall only require the station type to be changed and the proper software designation to be selected. Alterations shall not require field wiring or system head-end alterations. All field wiring and system head-end equipment shall support any type of station, at the time of installation. All contractor proposals shall reflect this capacity. Failure to submit and bid this project in this manner will be deemed as being in direct conflict of these specifications and will be rejected.
- f. There shall be no limit to the number of administrative display stations within the total capacity of the system.
- g. It shall be possible at any time to change the type of station at any location without equipment or wiring changes except for administrative VoIP phones that utilize existing LAN connections. Systems that limit the quantity of each station type or require future additional equipment and/or system expansion to provide additional administrative telephones shall not be accepted as an equal.
5. The system shall be a global switching system, providing up to 512 unrestricted simultaneous private telephone paths per facility. The system shall also be capable of providing up to 512 amplified intercom paths per facility. One amplified intercom path shall automatically be provided with each increment of 24 stations of system capacity. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. Amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the switch sensitivity and delay times of the VOX circuitry.
6. It is of utmost importance that emergency calls from staff stations receive prompt attention. Therefore, it is important that there be an alternate destination in case the emergency call does not get answered at the primary location. To this end:
 - a. The system shall provide 911 Dial-Through with specific outside line(s) dedicated only for this function to ensure that the line is available all the time for 911 calls. The 911 Dial-Through is available to any station that can dial.
 - b. The 911 CO lines will be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, the ongoing call shall be disconnected and the 911 call shall be placed.
 - c. Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall announce at the top of the call queue of their respective administrative telephone(s). Should that emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternate speaker station then prompt the caller to make a verbal call for help. During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer to Station have an

associated administrative telephone, it too shall ring the distinctive Emergency ring.

- d. The Emergency Transfer to Station shall be field programmable.
 - e. Should the original administrative telephone be engaged in a non-emergency conversation, its conversation shall be automatically terminated, indicated with an alert tone, and then reconnected to the station that generated the Emergency Call.
 - f. Should the administrative telephone be engaged in an emergency conversation, successive emergency calls shall log into the call queue as well as transfer to the Emergency Transfer Station for their verbal call for help. Upon termination of the initial emergency conversation, the next one shall immediately ring the administrative telephone.
 - g. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the administrative telephone shall not be deemed as equal.
7. There shall be a System-Wide Facility Emergency All-Call feature. The Emergency All-Call shall be accessed from designated administrative phones or by the activation of an external contact closure which shall give the third audio program input emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tone Distribution.
- a. Considering that emergencies calls are to be treated with the highest level of concern. Systems which do not regard Emergency-All-Call page from an administrative telephone with the highest priority shall not be deemed as equal.
 - b. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency functions.
 - c. The Emergency All-Call shall capture complete system priority, and shall be transmitted over all speakers in the facility. It shall also activate an external relay, which can be used to automatically override volume controls and other systems.
 - d. Systems without Emergency All-Call, or systems with All-Call that cannot be activated by external means, or which do not capture complete system priority or activate an external relay, shall not be acceptable.
8. There shall be at least four Dedicated Emergency Alarm Tones. Each may be accessed by dialing a three-digit number from designated administrative telephones. These emergency tones should be separate from the time tones. Systems using external alarm generators, or having less than four emergency alarm tones shall not be acceptable.
- a. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access Emergency Alarm Tones.
9. There shall be four (4) External-Function Relay Driver Outputs, accessible from designated Quantum Commander Users or Administrative Display Telephones by dialing a four-digit number. These outputs remain set until accessed and reset at a later time. The user shall have the ability to review the status of each relay driver. A

plain English menu, prompting the user through the fields without requiring the user to remember any dialing sequences shall support this feature. Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be deemed equal.

- a. The stations shall be capable of being programmed for security contact relays for use with magnetic locks, motion detectors, cameras or any low-voltage, dry contact creating device. System using security stations for control of external functions shall not be acceptable.
 - b. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access external relay functions.
10. There shall be a program-material interface included with each node, which shall accept up to four (4) Bogen Power Vector Series program modules. Systems requiring an external program source interface shall not be acceptable.
11. There shall be an outside line feature. The circuitry shall interface with the station ports of an external telephone system, and shall provide facilities for up to 960 incoming lines per facility which shall be designated by the user to ring "day" and "night" administrative display stations or administrative stations. Where an administrative display station is designated to receive outside line calls, the phone shall ring with a unique tone and the outside line number shall appear on the display panel. The option shall also provide the ability to make outside line calls from Administrative Display Stations or Administrative Stations. This ability shall be programmable for each phone and there shall be thirty-two Classes of Service available to any station. This feature shall be capable of supporting DID, DISA, and a Security DISA function.
 - a. Cellular system access for Security is of the utmost concern. Wireless security page offers a password-protected Security DISA feature that shall be accessible only from authorized Police, Fire, Emergency personal or an off-premise security office, which monitors the facility's security system. It shall function as follows: upon confirmation of the password DISA number, the system shall allow security personnel to dial access any station and monitor the activity without pre-announce tone or the privacy tone. This will then allow the security office to determine exactly what the conditions are in the station and the actions need to be taken.
12. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
13. There shall be an automatic level control for return speech during amplified-voice communications.
14. Each station loudspeaker shall be assignable to any one, any combination, or all of 64 Multi-purpose zones or any of the 16,000 hard-wired zones per facility.
 - a. Each station loudspeaker shall be assignable to any one, any combination, or all of 64 Multi-purpose zones. Systems with less than 64 Multi-purpose zones shall not be acceptable.
15. There shall be thirty-two (32) Flexible Time-Signaling Schedules with a total of 1024 user-programmed events per facility. Each event shall sound one of user-selected tones or external audio. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized Quantum Commander User via Web browser. Systems, which do not provide a minimum of thirty-two (32) flexible

time-signaling schedules or a choice of eight (8) time tones plus external audio, shall not be acceptable.

16. An internal program clock (with battery backup) shall be included, allowing a total of 1024 user-programmed events per facility. It shall be possible to synchronize the internal program clock with an external master clock. Systems, which do not provide an internal program clock and/or cannot synchronize with an external master clock to meet these specifications, are not equal.
 - a. There shall be thirty-two (32) flexible time-signaling schedules. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized Quantum Commander User via Web browser on the LAN/WAN.
 - b. The built-in Master Clock corrects time by accessing the LAN/WAN NTP time server.
 - c. The Quantum Processor is capable of adjusting the Daylight Savings Time automatically.
 - d. Each event shall be able to be directed to any one or more of the sixty-four (64) Multi-purpose time-signaling zones.
 - e. Each of the 64 Multi-purpose zones shall have a programmable "tone duration" unique unto itself. For example: the gymnasium shall receive a time tone for ten (10) seconds while the rest of the facility receives a tone for five (5) seconds.
 - f. Each event shall sound one of eight (8) user-selected tones or external audio. Each event may utilize a different custom tone. It shall be utilized to send the gymnasium, shop classes, and pool (if necessary), a separate time tone to indicate "clean up." Minutes later the entire facility can then receive the same time tone to indicate class change.
 - g. Each of the eight (8) Distinct Time Tone Signals may be manually activated by selected Administrative Display Phones or from an authorized Quantum Commander User via web-browser. These tone signals shall remain active as long as the telephone remains off-hook, or until canceled from the keypad or Quantum Commander.
 - 1) Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access manual time-tone functions.
 - 2) Systems that do not provide at least thirty-two (32) flexible time signaling schedules or do not provide automatic activation of schedules shall not be acceptable.
 - h. Shall have the capability to control Analog, Digital and Wireless Secondary Clocks.
17. There shall be a zone-page/all-page feature that is accessible by selected administrative VoIP phones and administrative phones.
 - a. There shall be automatic muting of the loudspeaker in the area where a page is originating.
 - b. There shall be a pre-announce tone signal at any loudspeaker selected for voice paging.

18. There shall be a voice-intercom feature that is accessible by selected administrative phones, administrative VoIP phones and all administrative display phones.
 - a. There shall be a periodic privacy tone signal at any loudspeaker selected for amplified-voice communication.
 - b. There shall be a pre-announce tone signal at any loudspeaker selected for voice-intercom communication.
 - c. Privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
 - d. There shall be an automatic switchover to private telephone communication should the person at the loudspeaker pick up his handset.
 - e. By picking up the receiver and dialing the first digit of the number of the station to be called, that number shall appear on the display along with a loudspeaker symbol, prompting the user to enter the next digits. There shall be no confusion as to the type of conversation that is to be established.
19. There shall be a telephonic communication feature, which is accessible by all Administrative VoIP Phones, Administrative Phones, and Administrative Display Phones.

2.3 COMPONENTS AND DESCRIPTIONS

- A. The Quantum Multicom IP must be capable of supporting the existing Multicom 2000 hardware and functions as well as the new features across the Quantum Processor's interfaced over the LAN. The VoIP capabilities of the QSPC1 Quantum Processor Card will enable the support of the features across the various processors' nodes. The sections below cover how the system will handle each of the existing and the new features in the QSPC1 product. Systems that do not allow the reuse of existing equipment or are not backwards compatible shall not be deemed acceptable. Systems that don't allow processors to be seamlessly integrated via the LAN/WAN are not considered equal.
- B. Quantum Multicom IP:
 1. The Quantum facility shall have a minimum of one node/processor and a maximum of 64 interconnected nodes/processors. A maximum of 100 facilities can be interconnected into a district.
 2. The station numbers, program buses, etc. shall be identified with a QSPC1#, Station card# and port# or QSPC1#, program#.
 3. Audio Information will be transmitted between the processors on the LAN/WAN using VoIP technology. Quantum will utilize all of the existing Multicom 2000 hardware except the current processor card. Thus making Quantum Multicom IP backwards-compatible with existing Multicom 2000 systems.
 4. The processor software shall be upgradeable via Quantum Commander. The System shall maintain Active/Standby loads and whenever the upgrade takes place, the current active load shall be overwritten as Standby and new load shall be copied as Active. The system shall reset itself and boot up with the latest load once the upgrade is success. If the system cannot come up with a new load, it shall revert to the old working load.
 5. It shall be possible for Quantum schools to exchange 'station-to-station' calls and 'inter-facility All-Call paging' to a single facility or all facilities in a district using VoIP technology.

6. The primary QSPC1 shall be configured to act as a Gateway for facility point-to-point calls. Using Quantum Commander, every facility shall be configured with the IP addresses of the primary QSPC1 systems of all the other known facilities (maximum of 99 additional), and an organizationally private multicast IP address (i.e. 239.192.x.y series), which shall be used for inter-facility paging.
7. The maximum number of simultaneous inter-facility point-to-point calls supported is based on the actual performance of the network and the CPU load. The voice quality of the inter-facility calls may vary based on the network conditions.
8. The system shall facilitate the playing of short audio clips repetitively played until stopped by the Quantum Commander User or administrative display phone MCDS3 whichever occurs earlier.
9. A built-in Master Program Clock, with battery backup, shall be included to automatically control class change or other signals. The Master Program Clock shall have 1024 events that may be programmed into any of the 32 time signaling schedules, and/or 32 flexible holiday schedules. Systems that rely on external master clock shall not be considered equivalent.
10. Network Time Synchronization. The system shall be capable of periodic update/synchronization of the processor's time with a Network Time Server via the school's LAN/WAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent.

C. Quantum Commander:

1. The processor utilizes a web-based programming tool. The Quantum Commander is built into the QSPC1 processor card and upon boot up, users can login to the Quantum Commander Web Server via their web browser.
2. The Quantum Commander shall be broken into three access levels depending on user access credentials. Systems that do not provide at least three (3) levels of access are not equal.
3. Only the Administrator and Technician shall have access to add/delete/modify the database objects.
4. Users shall have display only access to see the data objects that include configuration, alarms, and performance data and perform certain operations based on the user's CoS (Class of Service).

D. Administrative Display Phone:

1. Administrative Display Phones shall be Bogen Model MCDS4. The administrative telephone display panel shows the time of day and day of week, the current time signaling schedule, and the station numbers and call-in priority of staff stations that have called that particular administrative station. A 3-key response is used to scroll the display, and answer or erase normal, urgent, and security calls. Depending upon the system access level, an administrative station can use display menus to activate zone pages, alarm signals and external functions, as well as select program sources and distribute or cancel a program to any or all speakers or zones.
2. Administrative stations shall have the ability to dial and have the option of dialing either the loudspeaker or phone at each station location. The system shall automatically switch from phone-to-intercom communication to phone-to-phone communication when the staff handset or enhanced staff phone on the receiving end of the call is lifted.

3. The Administrative Display Phone shall display the classroom number of any station that calls 911. This feature will notify the main office when a classroom has dialed 911 emergency centers so that administrators can direct emergency personnel to the correct physical location in the building when they arrive. Systems that do not provide this feature will not be deemed equal.

E. Administrative Wall Display:

1. Administrative wall display shall be a Bogen Model MCWD. The wall display shows the time of day, current time signaling schedule that is running, and the station numbers and call-in priority of call switches, and emergencies from Administrative VoIP Phone and Administrative Phones.
2. The Administrative Wall Display shall display the classroom number of any station that calls 911. This feature will notify the main office when a classroom has dialed the 911 emergency centers so that administrators can direct emergency personnel to the correct physical location in the building when they arrive. Systems that do not provide this feature will not be deemed equal.

F. Administrative Phone:

1. Classroom phones shall be one of the following Bogen Model(s)
 - a. MCDS4 – Administrative Display Phone
 - b. MCIPP – Administrative VoIP Phone (Desk or Wall)
2. The Station goes Off-Hook and dials the 3- to 6-digit (preceded by an * if calling a telephone instead of loudspeaker) number of the desired station. The call is routed to any station (admin/staff). The classroom phone shall be capable of the following features:
 - a. Emergency Call involves going off hook and flash hook the switch at least four times. The Call is then switched to the assigned Admin Phone. This requires the display of the architectural number on the Administrative Display phone and or Wall Display. Systems that do not provide this feature are not equivalent.
 - b. Alarm Distribution.
 - c. Audio Program On/Off.
 - d. Call Forward activation for All-Calls/Busy/No Answer/Busy or No Answer.
 - e. Cancel Call Forward.
 - f. Conference Calling.
 - g. Transfer Call.
 - h. Dial administrative phone, dial the station number to call to the speaker or dial the station number preceded with * to call the phone. The call shall be routed to the administrative display phone and/or administrative wall display showing the architectural number that is calling.
 - i. Emergency All-Call shall be broadcasted to all the stations in the facility.
 - j. Place Outside Call.
 - k. Remote Answer.
 - l. Single-Zone/All-Station Page.

- m. Call Waiting Tone for Outside Calls, and it shall be possible to feed the call waiting tone to the Administrative Phone during a conversation.

G. Classroom Call Staff Stations (as indicated on the drawings):

- 1. Staff Stations shall be Bogen Model:
 - a. SC-1 – Call Switch.
- 2. Shall be capable of Normal/Urgent/Emergency Calls.
- 3. Normal/Urgent Call involves pressing the Call Switch once or lifting the Telephone Handset. The Call is then switched to the Admin Phone. This requires the display of the architectural number on the Admin phone and/or Wall Display.
- 4. Emergency Call involves pressing the emergency call switch; flash hook the switch at least 4 times in a non-dial analog handset with Call Level Normal or Urgent; pressing the call switch or hook switch one time in a non-dial analog handset with Call Level Emergency only. The Call is then switched to the Admin Phone. This requires the display of the architectural number on the Admin phone and/or Wall Display.
- 5. Emergency Link Transfer - If the emergency call is unanswered by the Administrative Display Phone and the emergency link transfer is provisioned and programmed; the emergency call will be forwarded to the loudspeaker associated with that station. Any station/admin phone with speaker can be programmed for the Emergency Link Transfer. Systems that do not provide Emergency Link Transfer will not be considered equal.

H. Secondary Clocks:

- 1. Analog Synchronous Clocks with minute and second hands.

The secondary clock shall be a Bogen BCAM series clock with automatic-selectable correction protocols. It shall be designed to be used in either a 2-wire or 3-wire system. Upon receipt of the digital signal, the clock shall immediately self-correct. The secondary clock shall also accept sync-wire communication protocols with hourly and daily correction. The secondary clock shall have a microprocessor-based movement and shall be capable of being used as a stand-alone clock. The clock shall have a low-profile/semi-flush smooth surface metal case. The crystal shall be shatterproof polycarbonate with no visible molding marks. Glass is unacceptable. The clock shall have black hour and minute hands and a red second hand. The clock shall have U.L., cUL, and F.C.C. compliance's.

I. Intercom/Paging System Speakers:

- 1. Interior Speakers shall be Bogen:
 - a. Flush Wall/Ceiling Speakers: S86T725PG8U/RE84
 - b. Ceiling Speakers: CSD2X2 Drop-In Ceiling Speakers
 - c. Surface Wall Speakers: MB8TSQ/SL Metal Box Speakers
 - d. Surface Wall Speakers: WBS8T725 Wood Baffle Speakers
- 2. Combination Clock/Speakers shall be:
 - a. Flush Clock/Speaker Combination: Lowell SCB-300/PC312 Enclosure with a Lowell 805T725 Speaker and a Bogen BCAM-1BS-12R-1 Secondary Clock

- b. Surface Clock/Speaker Combination: Lowell SCB700/PC712 Enclosure with a Bogen S86T725 Speaker and a Bogen BCAM-1BS-12R-1 Secondary Clock
- 3. Outdoor Speakers shall be Bogen:
 - a. FMH15T mounted in BBFM6 flush-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille.

J. Quantum Commander:

- 1. The processor utilizes a web-based programming tool. The Quantum Commander is built into the QSPC1 processor card, and upon boot up, user can login to the Quantum Commander Web Server.
- 2. The Quantum Commander shall be broken into three access levels depending on user access credentials. Systems that do not provide at least three (3) Levels of access are not equivalent. The three levels are:
 - a. User
 - b. Administrator
 - c. Technician
- 3. Only the Administrator and Technician shall have access to add/delete/modify the database objects.
- 4. Users shall have display only access to see the data objects that include configuration, alarms, and performance data and perform certain operations based on the user's CoS (Class of Service).
- 5. The following Menu Items must be available on the Multicom IP Quantum Commander:
 - a. File - Open Database, New System, Save, Delete, Report and Exit, Upload Database, Download Database, Download Software, Diagnostics, Tones and Announcements, Relay Configuration, Program Distribution, Media Assignment, List Passwords, Add Password, and Change Password.
 - b. There shall be an audible ring signal announcing that a call has been placed to that station.
 - c. Upon picking up the receiver and dialing * (star), a telephone symbol shall appear on the display, prompting the user to enter the number of the station to be called. There shall be no confusion as to the type of conversation that is to be established.
 - d. There shall be an automatic disconnect of Staff Handsets left off-hook to prevent them from tying up communications channels. The station shall receive a busy signal and shall automatically disconnect after 45 seconds. Systems shall also be capable of doing off hook emergency call-in.
 - e. There shall be an automatic disconnect of Administrative Display Phones, Administrative VoIP Phones, and Administrative Phones to prevent them from tying up communications channels. When a phone goes off-hook and does not initiate a call within ten seconds, the station shall receive a busy signal and shall automatically disconnect after 45 more seconds.
 - f. Staff and Administrative Phone Stations may be programmed to ring an Administrative Display Phone during day hours and another Administrative

Phone during night hours. Day and Night Hours shall be user-programmable. Assignment of Staff Stations shall not be restricted to any particular Administrative Station. Systems that limit the number and assignment of staff call-in to particular Administrative Station of Administrative Stations shall not be acceptable.

6. Each staff call station shall be programmable for one of three call-in types, as follows:

Normal / Emergency
Urgent / Emergency
Emergency

- a. Staff Call Stations programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an emergency call by repeated flashing of the hook switch or repeated pressing of the call-in switch. Systems, which require additional switches and/or conductors to initiate an emergency call, shall not be acceptable.
 - b. Emergency Calls from Administrative VoIP Phones, Administrative Phones or Staff Call Switch Stations shall interrupt a non-emergency call in progress at the designated Administrative Display Phone. The administrator shall receive a warning tone and be connected to the emergency caller. The disconnected party shall receive a busy signal. Systems which do not provide emergency call interrupt shall not be acceptable.
 - c. It shall be possible to connect a single push emergency call-in switch to any Administrative VoIP Phone or Administrative Phone, without effecting normal station operation.
 - d. Normal and Urgent calls shall be logged into queue for the designated administrative display phones.
 - e. Administrative Display Phones shall ring for a period of 45 seconds when they receive a call, and then stop ringing.
 - f. Each queue shall first be sorted according to call priority (emergency calls, then urgent calls, and then normal calls). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems, which do not sort calls according to priority and order received, shall not be acceptable. 1) The display shall simultaneously show up to four (4) Staff Call Switch Station Calls pending. Additional calls, beyond four (4), shall be indicated by an arrow pointing down thus prompting the user that additional calls are waiting.
 - g. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.
7. Administrative VoIP Phones or Administrative Phones shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up the handset.
- a. Administrative VoIP Phones or Administrative Phones shall be able to make a normal call to any Administrative Display Phone by dialing the number. They shall also be able to initiate an Emergency Call by flashing the hook switch. Emergency Calls shall ring the Designated Day/Night Administrative Display Phone and then their speaker will be connected to the emergency station if not answered within a predetermined time period. The system shall provide for

selected administrators to have a PIN Numbers. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the particular phone being used.

8. Student Phone:
 - a. Student Phone shall be supported. The Student Phone can only make 10-digit (7 digit or less than or equal to 10 digit), 0 local and 911 calls. The call duration shall be set to 5 minutes. The dial tone shall be fed momentarily at 00:04:30, 00:04:40, 00:04:50, then at five minutes, calls are disconnected. The student phone cannot receive any incoming calls.
 - b. The Station is not allowed to dial the same number within 30 minutes and a busy signal shall be fed to the Station if the number is dialed.
9. Administrative Display Phones shall be equipped with a 4x16 character alphanumeric display panel.
 - a. Administrative Display Phones shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.
 - b. The display shall normally show the time of day and day of week, the current time signaling schedule, and the numbers of up to four stations calling in along with the call-in status of each station (normal, urgent, emergency). When dialing from the Administrative Display Phone, the display shall indicate the station number and type of station (loudspeaker or handset) being dialed.
 - c. The display shall also provide user-friendly menu selections to assist the operator when paging and distributing program material. Displays shall be in English with internationally recognized symbols for maximum ease of use. Systems, which require the operator to memorize long lists of operating symbols or control codes, shall not be acceptable.
 - d. Administrative Display Phones shall be programmable for one of 3 station types for system access, as follows:
 - 1) Shall permit dialing any station in the system; turn program material on/off at their location; scroll, erase and auto-dial call-waiting queue; make conference calls and transfer calls; call forward to other administrative stations; make all-zone pages and emergency all-zone pages; have access to outside lines and be designated to receive outside line calls.
 - 2) Select and distribute or cancel program material to any combination of stations, paging zones, or all zones; set/reset alarm/external functions and zone paging.
 - 3) Bump or join a conversation in progress, manually initiate time tones.
 - e. Program selection, and its distribution or cancellation shall be accomplished from a designated administrative display telephone, with the assistance of the menu display system. Distribution and cancellation shall be to any one, or combination of speakers, or any zone(s), or all zones. It shall be possible to provide three program channels at the same time.
 - f. It shall be possible, via an Administrative Display telephone, to manually initiate any of eight (8) tones or any of the emergency tones. The tones shall be

g. Each Administrative Phone shall maintain a unique queue of all stations calling that particular phone.

- a. Station Initialization shall be accomplished from an authorized Quantum Commander User via web browser. All station initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following station initialization parameters:

11. Rollover EOL (End-Of-Line Device)

12. Admin AAA Group (Always An Answer)

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- b. Once the Admin Group is set:
 - 1) For normal calls, if the primary Day/Night Admin Phone is busy/no answer, all the phones in the Admin Group shall ring.
 - 2) For emergency calls, if the primary day/night phone does not answer, all the phones in the Admin Group shall ring.
 - 3) On no answer from any of the admin phones and if the emergency announce link is configured, the call shall be transferred to the emergency announce link as per the existing procedures.
 - 4) On answer from any of the Admin Phones, all the other phones shall stop ringing.

2.4 EQUIPMENT

A. To fulfill the requirements, the following control equipment shall be provided:

- 1. Bogen TCPER 60" communications rack.
- 2. One (1) Bogen QSPC1-IP processor card.
- 3. One (1) Bogen MC512 power supply.
- 4. One (1) Bogen MC2626 power supply.
- 5. One (1) Bogen MCAPI audio program interface.
- 6. One (1) Bogen rack mounting mainframe.
- 7. Five (5) Bogen MCAC analog cards.
- 8. One (1) Bogen MCSC station card.
- 9. Five (5) Bogen MCRRP relay cards.
- 10. One (1) Bogen CDR-1 AM/FM CD Player
- 11. One (1) Bogen DCM-290P Five Disk changer
- 12. One (1) Bogen HTA250 amplifier.
- 13. One (1) MCTC telephone access card with full interface to the school telephone system.
- 14. TRIPPLITE BC1400 UPS unit.
- 15. Middle Atlantic CBS-ERK-20 Base with Casters
- 16. Bogen ACFDS AC Line Filter
- 17. Bogen SAX-1R Aux Mic Module (Qty. 1)
- 18. Bogen MCTC Telephone Interface Card
- 19. Bogen MCOC Telephone Line Card
- 20. Bogen MCOCA Telephone Ribbon Cable

21. Bogen WMT-1A 600 Ohm Transformer
22. SSI 25' Power Cord Extension
23. 25 Pair 22 Gauge Umbilical Cord properly laced and terminated to Bogen SK-2522 and 66M Connection Panels

2.5 TERMINAL BLOCKS

- A. All conductors in all-terminal cabinets, equipment rack, etc., shall be terminated on Siemens 66M1-50 punch blocks or approved equal.

2.6 WIRING CABLES

- A. Each Speaker/Call Switch to console: West Penn 357
- B. Outdoor speakers: West Penn #291
- C. Clock Cable: West Penn 236 or THWN in conduit
- D. Speaker Multi Conductor Cables: General Cable 25 pair 22 gauge direct burial PE-22 overall shield cable. Quantity per wing as required
 1. All cables and wires shall be Copper and shall be installed in raceways per C.E.C. Code. All conductors and wires shall be new when delivered to the job site in unbroken packages, with the manufacturer's name and voltage class that shall be plainly indicated on cables and wires.
 2. All cables and wires shall be National, General Electric, General Cable, West Penn or approved equal. All conductors installed in underground conduit shall be type "THWN" or UL listed for wet location or direct burial.
- E. Call-in Multi Conductor Cables: General Cable 25 pair 22 gauge direct burial PE-22 overall shield cable. Quantity per wing as required
 1. All cables and wires shall be Copper and shall be installed in raceways per C.E.C. Code. All conductors and wires shall be new when delivered to the job site in unbroken packages, with the manufacturer's name and voltage class that shall be plainly indicated on cables and wires.
 2. All cables and wires shall be National, General Electric, General Cable, West Penn or approved equal. All conductors installed in underground conduit shall be type "THWN" or UL listed for wet location or direct burial.

PART 3 – EXECUTION

3.1 DIVISION OF WORK

- A. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.
- B. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The manufacturer's authorized representative shall perform the balance of the system, including installation of speakers and equipment, making all connections, etc. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

3.2 INSTALLATION

- A. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
- B. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.
- C. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall be a unique number, located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.
- D. Shielding: Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.
- E. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.3 GROUNDING

- A. The Contractor shall provide all necessary grounding for the entire system in accordance with and required by the National Electric Code, and the State of California "Safety Orders".

3.4 TEST AND ADJUSTING

- A. The Contractor shall furnish all required test instruments and equipment. Each piece of equipment and the entire systems shall be adjusted and readjusted to insure proper function of all equipment, elimination of noise, and vibration and left improper operating condition.

3.5 ACCEPTANCE

- A. Before the work shall be accepted, the Electrical Contractor shall demonstrate to the District and the Engineer that the entire installation is complete and in proper operating condition and the Contract has been properly and fully executed.
- B. Upon acceptance of the work, the Contractor shall deliver to the District a written guarantee to the effect that all parts of the work, including all individual items of equipment and materials and the systems as a whole, shall be free from defects for a period of one year. Upon proper notice, the Contractor shall make good, at their expense any defect that develops or becomes apparent during this period.

END OF SECTION

09/21/18

SECTION 27 51 26

ASSISTIVE LISTENING SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes the following:
 - 1. Provision of an Assistive Listening System for use in the Blackbox Theater and Library.
- B. Related Section includes the following:
 - 1. Division 10, Section "Signage".
 - 2. Division 26, for Electrical Requirements.
 - 3. Division 27, for Communication Systems.
- C. The Assistive Listening System shall be interfaced with the AV system.

1.3 SUBMITTALS

- A. Product data for each type of product indicated.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: The Assistive Listening System shall be Part Number LS-03-072 by Listen Technologies Corporation, (800) 330-0891; or equivalent as approved by Architect. System shall include:
- B. Blackbox Theater (Portable System):
 - 1. (1) LT-800-072 Stationary Transmitter.
 - 2. (2) LA-122 Universal Antenna Kit.
 - 3. (1) LA-326 LT-800/LR-100 Rack Mounting Kit.
 - 4. (2) LT-400 Portable Display FM Receiver (72 MHz)
 - 5. (2) LA-164 Ear Speakers
 - 6. (2) LA-361 High Capacity AA Alkaline Batteries (pkg of 2)
 - 7. LA-304 ADA Compliance Signage Kit
 - 8. (1) LA-317 '4 Unit' FM Products Charging / Carrying Case

C. Library (Portable System):

1. (1) LT-800-072 Stationary Transmitter.
2. (2) LA-122 Universal Antenna Kit.
3. (1) LA-326 LT-800/LR-100 Rack Mounting Kit.
4. (2) LT-400 Portable Display FM Receiver (72 MHz)
5. (2) LA-164 Ear Speakers
6. (2) LA-361 High Capacity AA Alkaline Batteries (pkg of 2)
7. LA-304 ADA Compliance Signage Kit
8. (1) LA-317 '4 Unit' FM Products Charging / Carrying Case

2.2 TRANSMITTER (PART #LT 800-072)

- A. The stationary FM transmitter shall be capable of broadcasting on 57 channels.
- B. The transmitter shall have a SNR of 80dB or greater.
- C. The output power shall be adjustable to quarter, half, or full.
- D. Channel tuning shall be capable of being locked.
- E. The device shall have an audio frequency response of 50Hz to 15KHz \pm 3dB at 72MHz. It shall have two mixing audio inputs.
- F. The device shall have the following radio controls:
 1. Input level.
 2. Mix level.
 3. Adjustable low pass shelving filter.
 4. Audio processor which is capable of automatic gain control and limiting.
- G. Unit Dimensions: 8.50" wide x 9.12" deep x 1.75" high.

2.3 RECEIVER (PART #LT-400)

- A. The FM receiver shall be capable of receiving on 57 wide and narrow band channels and have an SNR of 80dB or greater.
- B. The receiver shall be capable of seeking channels.
- C. The device shall have an adjustable squelch.
- D. The device shall have an audio frequency response of 50Hz to 15KHz, \pm 3dB at 72MHz.
- E. The device shall incorporate an LCD display that indicates channel, battery level, low battery, battery charging, RF signal strength.
- F. The receiver shall incorporate automatic battery charging circuitry for recharging of NiMH batteries.

G. Unit dimensions: 3" wide x 1" deep x 4.25" high.

2.4 UNIVERSAL ANTENNA KIT (PART #LA-122)

- A. Universal antenna kit shall be capable of operating from 72.0 to 76.0 MHz with a center frequency of 73.5 MHz and from 216 to 217 MHz with a center frequency of 216.5 MHz.
- B. Kit shall include the necessary mounting hardware to mount antenna on a single or dual electrical box, directly on a wall, on a ceiling electrical box and / or on a flat surface.
- C. The antenna shall have a BNC connector and the kit shall come with 25 ft. of RG58 coax cable with BNC connectors.
- D. The kit shall include rigid and flexible antenna radials.

2.5 RACK MOUNTING KIT (PART #LA-326)

- A. The mounting kit shall be capable of single and dual racking mounting of a Listen stationary transmitter or stationary receiver. The kit shall include a Plexiglas cover that will prevent end users from making adjustments to the mounted equipment.

1. Dimensions: 19" x 1.75" x 8".

2.6 EAR SPEAKERS (PART #LA-164)

- A. Single ear, fits over the ear, may be used with hearing aids.
- B. Easy to clean hard plastic.
- C. Impedance: 32 Ohm
- D. Maximum Input: 130 mW.
- E. Connector: 3.5 mm mono.
- F. Cable length: 36 inches
- G. Weight: 4 oz.

2.7 ADA COMPLIANCE SIGNAGE KIT (PART #LA-304)

- A. Acrylic Sign: 6.5" x 8.5" and static cling window sticker 6" x 8", stating the following:
 - 1. "This facility is equipped with a hearing assistance system. Please ask for a receiver at the facility Main Office".

2.8 UNIT CHARGING / CARRYING CASE (PART #LA-317)

- A. Hard lockable case with interior foam to charge 4 receivers or portable transmitters with NiMH batteries. Case stores power supply and earphones. Include keys and carrying strap.
 - 1. Dimensions: 11.8" x 7.5" x 3.75".
 - 2. Primary Power: 110-120 VAC, 60 Hz, 15W.
 - 3. Secondary Power: Output 7.5 VDC, 600 Ma.
 - 4. Power Cord: 6 ft. length.

5. Weight: 2.6 lbs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in strict accordance with manufacturer's written instructions.
- B. Install ADA compliant Assistive Listening signage as shown on the Drawings.
- C. The Assistive Listening system shall be installed as to interface with the AV system.

3.2 DELIVERY TO OWNER

- A. Deliver Assistive Listening System to Owner in original packaging and accompanied by manufacturer's operating manual and warranty information.

END OF SECTION

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SECTION 28 31 00
INTRUSION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Related Sections.
- B. Scope of Work.
- C. Applicable Publications.
- D. General Requirements.
- E. Design Criteria.
- F. Guarantees and Warranties.
- G. Products.
- H. Installation and Execution.
- I. Testing.
- J. Support and training.

1.2 RELATED SECTIONS

- A. Specific Division 27 Sections relating to work identified in the Technology Sections including:
 - 1. Section 27 00 00 – General Technology Requirements.

1.3 SCOPE OF WORK

- A. The following specification has been developed to address the installation of a complete Intrusion detection and Security System. This document is **not** a stand-alone specification. The installing contractor shall provide all equipment, labor, materials, and services required to install the complete Intrusion detection and Security System. The installation is to be accomplished in accordance with these specifications and accompanying plans.
- B. The system shall be engineered with minimum one security motion detector in each classroom, office and any occupied space with an exterior entrance. Other devices will be installed per plans. All devices will be individually wired back to the nearest building IDF/BDF room or cabinet. Each building will be individually wired back to a single building, which has been designated to house the main panel (see plans for exact location).

1.4 APPLICABLE PUBLICATIONS

- A. As defined in Section 27 00 00 – General Technology Requirements.

1.5 GENERAL REQUIREMENTS

- A. The installing contractor shall
 - 1. Provide equipment and labor to render the Security System complete and operable for all designated locations of the site as specified. Services shall include the cutting of acoustical tile.
 - 2. Provide any and all equipment, cables, devices and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system so that the system shall perform the function described herein in compliance with specified requirements.

1.6 DESIGN CRITERIA

- A. The intrusion detection control system specified with Catalog and model numbers are intended to establish the type and quality of equipment and system design as well as exact operating features required.
- B. Substitutions of products proposed to be equal to those specified herein will be considered only when the following requirements have been met:
 - 1. A complete list of such substituted products, with drawings, data sheets and standby battery calculation charts for 4 hours of standby time on all network functions.
 - 2. Substitute equipment and its capabilities must be a standard part of that systems current product line and must meet or exceed the capabilities of the equipment specified. Contractors are cautioned to conform to this specification so that the system provided will insure future options and priorities of the owner with regard to the systems use.
- C. The system shall include all the following functions and capabilities:
 - 1. Automatic time rearming of disarmed room.
 - 2. Individual disarm codes logged for each event.
 - 3. Various groups or individuals shall be given timed access to select areas.
 - 4. Changes made to access codes, groups, and times to be made from the control panel with the proper access code.
 - 5. Changes shall be made from the console with proper access codes, using the Scheduling computer.
- D. Access Levels:
 - 1. The system shall have the capabilities to relate code users to doors for access by time. It shall be possible to restrict any single code or groups of codes through the use of these access levels. The system shall have a minimum of 30 access levels and shall allow a minimum 16-character description of each.
 - 2. To increase system flexibility the system provided shall be capable of allowing a privileged operator to assign up to three different access levels per user. Assignment of any of

these access levels shall augment the capabilities of that provided by the primary level assigned.

E. Reports:

1. The system shall allow reports to be generated from the history accumulated on the system's fixed disk or from back-up media. These reports shall be created on an as needed basis by selecting the report parameters necessary based on time and date. The system shall allow the creation of preformatted parameters to be stored as archive report templates. These templates shall have a minimum 16-character title to easily identify the format to the operator. The system shall allow any report template to be cleared or modified. Archive templates shall be created through a selection process of event classifications available.

1.7 GUARANTEES AND WARRANTIES

- A. Guarantee the complete security system, in writing, against defects in workmanship and material for a minimum of one year after final acceptance. During this time, the entire system must be kept in proper operating condition at no additional labor or material cost to the district. The contractor will delineate the conditions of this warranty for this period.
- B. Warranty service must be rendered within 4 hours and all problems resolved within 24 hours of notification by the district.
- C. The manufacturer of the major components will maintain a replacement parts department and provide test equipment when needed.
 1. A complete parts department will be located in a geographical proximity consistent with rendering service within the stated twenty-four hour period.
 2. An ample stock of individual components and equivalent unit replacements will be carried for as long a period as demand warrants. This period will extend beyond the normal life expectancy of the equipment, with ten years being minimum period.
 3. Shipping costs associated with providing required equipment not available in local stock shall be the responsibility of the Contractor.
 4. The contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment and shall maintain a spare set of all major parts for the system at all times. All circuit packs and boards, instruments and control sub-systems shall be 100 percent backed up with stock at contractors facility.
 5. Furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices and that the system is operating satisfactorily.
 6. Furnish a written guarantee for a period of one year from substantial completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Equipment shall bear U.L. label.
- B. All materials that make-up a complete system shall be U.L. listed.

2.2 INTRUSION CONTROL PANEL

- A. Control Panel: Enclosure complete with (2) Bosch DX4020 Conettix Ethernet network and Power Sonic PS-1270 12V 7AH battery. Bosch D9412GV4-C with an additional Bosch D8103 & D101 enclosure, lock and key.
- B. Enclosure to include sufficient 8-point expanders to support homerun cables to each device. Bosch D8128D Octopopit.
- C. Popits Bosch D9127U.

2.3 POWER SUPPLY

- A. 12 VDC, 5 amp uninterruptible power supply with multi-regulator and battery changer in vented locking 11"H x 15"W x 4"D cabinet. AlarmSaf PS5-M003-UL.

2.4 MOTION DETECTORS

- A. Wall mounted passive infrared type. Bosch ISC-BPR2 Blue Line Gen2 PIR Motion Detector mount B335-3. Mount 4" below suspended ceilings. Mount between 10'-0" to 14'-0" where ceiling height is over 10'-0". In all cases the motion sensor should not be obstructed.

2.5 EXTERIOR BELL

- A. Amseco ABB-1014.

2.6 KEYPADS

- A. Wall mounted alarm set/disable keypad with illuminated 16-character vacuum fluorescent display and sounder. Off-white case. Bosch D1260.

2.7 CABLE

- A. #22/4 Conductor cable. West Penn 25241.
- B. #18/4 Conductor cable. West Penn 25244 (indoor), AQ25244(outdoor).
- C. IDEAL #89-610 Barrier Strips for consolidation of power wires at the panel end.
- D. Berk-Tek 11074739 CAT 6+ data cable. 2 cables from the Intrusion panel to the MDF rack located in the MDF room. At the intrusion panel the cables shall be terminated onto a (2) port SMB.

2.8 LABELS

- A. The contractor shall provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure heat, water, and time.
- B. Shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969.
- C. Shall be pre-printed using a mechanical means of printing.

- D. Where used for cable marking, provide vinyl substrate with a white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable. The cable marking should be immediately visible and be within two inches from the termination point.
- E. Where insert type labels are used, provide clear plastic cover over label.
- F. Labeling P-touch font size 4MM bold, black on White, 3/8" labeling tape on all panels and devices.
- G. Labels shall be numbered consecutively and separate for each type of use. Refer to Work Station Details and Floor Plan Device Numbering Example for additional information

PART 3 - EXECUTION

3.1 GENERAL

- A. As it is not practical to enumerate in these specifications all details of fittings and accessory equipment required for proper operation of the system herein described, it is understood that they will be supplied by the contractor in accordance with manufacturers installation standards without extra compensation.

3.2 SYSTEM INSTALLATION AND OPERATION REQUIREMENTS

- A. Install system per the manufacturer's instructions.
- B. Coordinate the operational compatibility of all locking devices not supplied by the Intrusion detection manufacturer with the Intrusion detection manufacturer.
- C. Motion detectors shall be "on" at all times, unless noted otherwise. Keypad units shall turn zone alarms on and off.
- D. Motion detector shall be located facing away from sunlight, heating elements, HVAC outlets and any turbulent air movements. It shall be confirmed by the JESD Inspector on site and ISDG.
- E. Ceiling mounted, 360° motion detector shall be adjusted to minimize the effects of sunlight, heating elements, HVAC outlets and any turbulent air movements. Any optical, module masking shall be removable without damage to the optical surface.
- F. Provide lock-on device on all circuit breakers serving security equipment. Determine panel locations.
- G. Provide by-pass key-switch to building area, if needed.
- H. Provide system software and all programming.
- I. Each detector shall have a dedicated wire to its local Intrusion Control Panel.
- J. No more than 6 detectors/zone

3.3 WIRE TERMINATING

- A. All conductors shall be equipped with spade lugs at terminations in terminals, motion detection units and controllers.

1. All splices shall terminate on terminal blocks and all wire shall be color coded.
 2. All wire shall have code marker tags and be indexed in all equipment and noted on as-built drawings, also on index sheet or cards placed in equipment and in as-built data folder.
 3. Leave an index sheet or card in all terminals and equipment cabinets and include a site zone plot plan in relay cabinet.
- B. Provide terminal boxes with terminals for termination of wiring even though they may not be indicated on Drawings. Adequate spacing shall be provided on bolted terminals for lead separation.

3.4 PERMITS, LICENSES, ORDINANCES AND REGULATIONS

- A. Any and all fees that pertain to the Security System and the work of the contractor required by state, county or city laws will be paid by the contractor. All other applicable permits or fees required by law, ordinances, tariffs and regulations shall also be paid by the contractor. The contractor must give all notices necessary in connection therewith.
- B. The contractor shall comply with all applicable federal and state laws, regulations, ordinances and codes, including all applicable OSHA and Uniform Commercial Code regulations and requirements which are in effect at the date of execution of the contract and which place obligations on the contractor with respect to its performance under the contract. In the event that sections of the contract explicitly address warranties and remedies in a manner which is not consistent with applicable provisions of the UCC, it is agreed that the provisions set forth in the contract shall apply. The contractor shall submit, prior to their start of tasks that involve work on the project, details of their safety program.

3.5 SYSTEM PERFORMANCE, TESTING, AND ADJUSTMENTS

- A. Splicing shall not be permitted. Any components and/or wiring and cabling that should be determined to be operating below manufacturer specifications shall be removed and replaced at no additional cost.
- B. The Intrusion Detection System shall detect all entries through a door-switched door, or motion of a body taking more than 2 steps in an area secured with motion detection equipment.
- C. System shall be complete and properly operating prior to calling for test.
1. The Inspector and Contractor shall walk test system and Contractor shall make minor necessary adjustments to system in presence of the Inspector.
 2. Contractor shall coordinate time of test with the Inspector. When all zones have been tested and found to be acceptable to the Inspector, a time test shall be performed.
- D. Time Test:
1. Contractor shall test the system from detectors to system reports for proper operation. Test shall run for a period of 3 days, 2 days of which shall be over a weekend. Zones shall not be connected to communicator until zone performances are approved by Inspector, and security technician.

2. Continue the system test for a MINIMUM of 3 days, of which 2 days are over a weekend.
3. Contractor shall instruct day and night staff on method of opening and closing of facility as related to the use of the security system.
4. When system is found to be acceptable and does not false alarm, the district will consider system to be in use.
5. Contractor shall make necessary adjustments of equipment as required during guarantee period. Faulty equipment shall be replaced immediately.
6. Test Equipment: Contractor to submit systems report for each day's test to Inspector, with date and zone noted. The contractor shall provide the initial software installation and setup necessary to render the system operable.
7. Provide all instruments for testing and demonstrate in the presence of the district representative that all circuit and wiring tests are free of shorts and grounds and that the installation performs as per these specifications and manufacturers specifications. Should any conflict in operational specifications arise, the contractor shall adhere to the more stringent performance values for acceptance testing. Each subsystem shall be fully tested by the contractor to ensure performance to the intent of the specifications and trouble-free operation.

3.6 FINAL TESTS AND ADJUSTMENTS

- A. Conduct full operational test with the districts monitoring service. Test the system and all system component terminations and cabling and wiring for consistent operation. Any troubles/problems/conflicts are to be addressed and/or repaired to the school monitoring contractor's satisfaction prior to acceptance of the Security System. Prior to the acceptance tests, an acceptance test plan is to be provided to the district representative for their approval. In addition, the district representative will be advised 48 hours prior to the contractor starting tests so that the representative may witness said tests.

3.7 REPORT

- A. Upon completion of above tests and necessary adjustments, submit a written report presenting test results, including numerical values, for all measurements for review prior to demonstration and final "acceptance testing".
- B. With the above report, the contractor shall submit written certification that the installation conforms to specifications, is complete, and is ready for final inspection and testing.

3.8 ACCEPTANCE TESTING OF COMPLETED INSTALLATION

- B. The contractor shall perform an operational check to assure that the system complies with all requirements of these specifications.
 - C. The contractor shall program the system to report alarms to the overall campus system as directed by the owner.
1. Upon arrival of the contractor's test report, and at the time set by the district representative, demonstrate to the designated representative that the final system adjustments and tests meet the performance requirements. Provide all labor, materials, tools, and measurement equipment necessary for these demonstrations, tests and adjustments at no additional cost.

2. The contractor's technical representative performing these tests must demonstrate familiarity with all details of the system. The test team must include the field supervisor in charge during the course of the installation work.
3. The contractor is responsible for all costs incurred to satisfy criteria requirements.

3.9 SUPPORT AND TRAINING

- A. The Intrusion Detection equipment supplied shall be a standard labeled product of the equipment supplier, bearing the company's name and having their exclusive model numbers. This company must be of established reputation and experience, regularly engaged in the intrusion detection/alarm business for a period of at least five consecutive years under its current company name. This company shall have a fully staffed office of sales and technical support representatives within [50] miles of this project.
- B. The Contractor shall properly instruct the persons designated by the district or principal as to the correct operational procedures of the system.
- C. Within the first 30 days from system start-up the equipment supplier shall provide not less than six hours (two, 3 hour sessions) for instruction of personnel in the operation and maintenance of the systems. This instruction time shall be scheduled as directed by the district.

END OF SECTION

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SECTION 28 46 00

FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1. SUMMARY

- A. This Section covers fire alarm systems, including initiating devices, audible and visible notification appliances, controls, supervisory devices and complete voice evacuation system. The new devices shall be connected into the existing fire alarm system manufactured by Siemens.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
 - 1. Fire alarm and detection operations.
 - 2. Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

1.2. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
 - 1. Division 21: "Fire Suppression"
 - 2. Division 26: "Electrical"
 - 3. Division 27: "Communications."
 - 4. Division 25: "Heating, Ventilating, and Air Conditioning"
- C. The system and all associated operations shall be in accordance with the following:
 - 1. California Building Code: CBC.
 - 2. NFPA 72, National Fire Alarm Code, 2016 Edition as amended.
 - 3. California Electrical Code, 2016 Edition as amended.
 - 4. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating

Systems.

5. Other applicable NFPA standards.
6. Local Jurisdictional Adopted Codes and Standards.
7. ADA Accessibility Guidelines.

1.3. SYSTEM DESCRIPTION

- A. General: Provide a complete, non-coded, addressable/conventional, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
- B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download.
- C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.
- D. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications.
- E. Wiring/Signal Transmission:
 1. Transmission shall be hard-wired, using separate individual circuits for each zone of alarm operation as required or addressable signal transmission, dedicated to fire alarm service only.
 2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class B.
 3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
- F. Remote Access:
 1. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.
 2. FACP shall have the capability to provide Remote Access through a listed

Internet Interface via a standard web browser user interface.

G. Required Functions: The following are required system functions and operating features:

1. Priority of Signals: Alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
2. Non interfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent activations.
3. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract.
4. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.
5. General Alarm: A system general alarm shall include:
 - a) Indication of alarm condition at the FACP and annunciator(s).
 - b) Identification of the device or zone that is the source of the alarm at the FACP.
 - c) Operation of audible and visible notification devices throughout the building until silenced at FACP.
 - d) Closing doors normally held open by magnetic door holders.
 - e) Unlocking designated doors.
 - f) Shutting down supply and return fans serving zone where alarm is initiated.
 - g) Closing smoke dampers on system serving zone where alarm is initiated.
 - h) Initiation of smoke control sequence through the building temperature control system.
 - i) Notifying the local fire department.
 - j) Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated.
6. Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:

- a) Activate the system supervisory service audible signal and illuminate the LED at the control unit and the graphic annunciator.
 - b) Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
 - c) Record the event in the FACP historical log.
 - d) Transmission of supervisory signal to remote central station.
 - e) Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.
8. System Reset:
- a) The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-arming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
 - b) Should an alarm condition continue, the system will remain in an alarmed state.
9. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
10. WALKTEST: The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:
- a) The city circuit connection and suppression release circuits shall be bypassed for the testing group.
 - b) Control relay functions associated to one of the 8 testing groups shall be bypassed.
 - c) The control unit shall indicate a trouble condition.
 - d) The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound to identify the device or zone.
 - e) The unit shall automatically reset itself after signaling is complete.
 - f) Any momentary opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

H. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
 2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
 3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
 4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
 5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported to the Central Monitoring Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
 6. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
 7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
 8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
 9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.
- I. Smoke Detectors: A maintenance and testing service providing the following shall be included with the base bid:
1. Biannual sensitivity reading and logging for each smoke sensor.
 2. Scheduled biannual threshold adjustments to maintain proper sensitivity for each smoke sensor.

3. Threshold adjustment to any smoke sensor that has alarmed the system without the presence of particles of combustion.
 4. Scheduled biannual cleaning or replacement of each smoke detector or sensor within the system.
 5. Semi-annual functional testing of each smoke detector or sensor using the manufacturer's calibrated test tool.
 6. Written documentation of all testing, cleaning, replacing, threshold adjustment, and sensitivity reading for each smoke detector or sensor device within the system.
 7. The initial service included in the bid price shall provide the above listed procedures for a period of five years after owner acceptance of the system.
- J. Audible Alarm Notification: By speaker signals in areas as indicated on drawings.
- K. Fire Suppression Monitoring:
1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
 2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
 3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.
- L. Power Requirements:
1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
 2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
 3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
 4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously while incoming power is present.
 5. The system batteries shall be supervised so that a low battery or depleted battery condition or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
 6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control
 7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.]

8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.4. SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
 1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
 2. Wiring diagrams from manufacturer.
 3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.
 4. System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
 5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, sensor, and auxiliary control circuits.
 6. Operating instructions for FACP.
 7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
 8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
 9. Record of field tests of system.
- B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

1.6 CLOSEOUT SUBMITTALS

- A. As-Built Project Records: Before acceptance of work and final inspection, the contractor shall provide project record "As-Built" drawings in AutoCAD, reflecting any and all changes and deviations made to the fire alarm system during construction. The drawings shall indicate the following:
 1. As-built physical routing of wires to devices, including junction box locations.
 2. As-built riser diagram showing the zoning of initiating devices and notification appliances.

3. As-built panel wiring diagrams of the fire alarm control panel(s).
4. Floor plan with final room number showing each alarm initiating device (1-10 for device 10 on IDnet 1 and 2-10 for device 10 on IDnet 2, etc.), and card number per notification appliance, TAC panel, and control point with their respective address identification number (i.e.) for addressable device number 5 on card 3, channel 1, branch 1 is 3-1-5. Device number 5 on card 3, channel 1 branch 2 can not exist as it would have the same ID number as the device on branch 1. The devices on the branches must have higher numbers than the devices on the previous branches.
5. Submitting the original shop drawings back to the fire alarm vendor and specifying "no changes" shall not be acceptable. Submitted as-builts should be true as-builts and kept throughout the duration of construction.
6. The acceptance testing records.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
 1. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.
 2. Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
 3. Smoke Detectors or Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.
 4. Detector or Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.
 5. Printer Ribbons: Furnish 6 spare printer ribbons.

1.8. QUALITY ASSURANCE

- A. Installer Qualifications: The fire alarm technician for the project shall be State of California certified. The fire alarm technician shall be responsible for assisting the contractor in completing the installation and overall testing of the fire alarm system.
- B. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.9. MAINTENANCE SERVICE

- A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 24 months, using factory-authorized service representatives.
- B. Basic Services: Systematic, routine maintenance visits on a quarterly basis at times

scheduled with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies. Refer to paragraph 1.3.I of this Section for maintenance service requirements of smoke detectors.

- C. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.
- D. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

1.10 WARRANTY

- A. The Contractor shall provide a two-year written warranty against defects in material and workmanship (parts and labor) furnished under the project. The costs of such warranty shall be part of the project cost. The PI shall sign off on the system after passing a final acceptance test of the system (with the presence of an DISTRICT representative) and the electrical/fire alarm contractor shall provide written documentation of the final test. The District shall in addition (optional) perform its own complete test to determine the working order of the fire alarm system. The warrantee period starts when the entire project is 100% completed (two years after acceptance, as defined by the fully signed NFPA 72 document). During the warranty period, the District shall monitor the site and request service as required through the appropriate installer. Prior to the expiration of the warranty period, the district may conduct a 100% test of the work performed. Any deficiencies found during that testing shall be corrected under the warranty agreement.
- B. The warranty shall include all necessary material, travel, labor and parts to replace defective components or materials at the job site. The Contractor shall commence repair of any "in warranty" defects within 24 hours of notification of such defects. Warranty service shall be supervised by a qualified factory-trained service representative.
- C. The Contractor shall make allowances in his warranty to cover diagnosis of system defects, which might ultimately be the responsibility of others to correct. When this occurs, the DISTRICT'S Representative and other affected trades shall be notified.
- D. The warranty shall include all necessary factory and field software required to perform the specified tasks.

PART 2 – PRODUCTS

2.1. ACCEPTABLE MANUFACTURER

- A. Manufacturers: The equipment and service described in this specification are those supplied and supported by Siemens per District Standards, no substitution shall be allowed.

2.2 FIRE ALARM CONTROL PANELS

- A. Fire alarm control panel is existing Siemens XLS.
- B. Furnish and install all associated Modules, addressable indicating and initiating devices with module for remote monitoring via internet.
- C. The following FACU hardware shall be provided:
 - 1. Power Limited base panel with red cabinet and door, 120 VAC input power.
 - 2. 2,500 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
 - 3. 2000 points of annunciation where one (1) point of annunciation equals:
 - a. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
 - b. 1 LED on panel or 1 switch on panel.
 - 4. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FACU LCD Display.
 - 5. One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
 - 6. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
 - 7. Three (3) Class B Addressable Notification Appliance Signaling Line Circuits (SLCs).
 - a. Each Addressable Notification Appliance SLC shall be rated at 3A and capable of supporting up to 63 Notification Appliances per channel.
 - b. Wiring shall be 18 AWG to 12 AWG unshielded twisted pair wire. Systems that require shielded wire for Notification Appliances shall not be accepted.
 - c. A constant voltage under both primary and secondary power conditions shall be maintained at the notification appliance field wiring terminal connections in the FACU to ensure the voltage drop on the circuit is consistent under both primary and secondary power conditions.
 - d. For systems that do not provide a constant voltage source at the FACU notification appliance field wiring terminal connections, the fire alarm contractor shall:
 - 1). Provide separate point-to-point voltage drop calculations for all notification appliances under worst case secondary power specifications, and
 - 2) Perform a complete functional test of all notification appliances under worst case secondary power conditions.

- f. Where required provide Intelligent Remote Battery Charger for charging up to 110Ah batteries.
 - g. Power Supplies with three (3) Class B integral Intelligent Addressable Notification Appliance Signaling Line Circuits (SLCs) for system expansion.
 - h. The FACU shall support up to (5) RS-232-C ports and one service port. All (5) RS-232 Ports shall be capable of two-way communications.
 - i. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
 - j. Fire Panel Internet Interface to provide supplemental notification and remote user access to the FACU using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3.]
 - k. Modular Network Communications Card.
8. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.
9. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.
- a. The system shall [have the capability] [include the necessary hardware] to provide expanded content, multi-line, operator interface displays as indicated on the drawings and specifications. The expanded content multi-line displays shall be Quarter-VGA (QVGA) or larger and be capable of supporting a minimum of 854 standard ASCII characters to minimize or eliminate the levels of navigation required for access to information when responding to critical emergencies and abnormal system conditions. The QVGA operator interface shall provide operator prompts and six context sensitive soft-keys for intuitive operation.
10. Distributed Module Operation: FACU shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):
- a. Addressable Signaling Line Circuits
 - b. Initiating Device Circuits
 - c. Notification Appliance Circuits
 - d. Auxiliary Control Circuits
 - e. Graphic Annunciator LED/Switch Control Modules.
 - f. Amplifiers, voice and telephone control circuits

11. Voice Alarm: Provide an emergency communication system, integral with the FACU, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:
- a. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface. Each amplifier shall be capable of performing constant supervision for non-alarm audio functions such as background music and general paging.
 - b. Dual alarm channels permit simultaneous transmission of different announcements to different zones or floors automatically or by use of the central control microphone. All announcements are made over dedicated, supervised communication lines. All risers shall support Class A or Class B wiring for each audio channel.
 - c. Eight channel digitally multiplexed audio for systems that require more than two channels of simultaneous audio. Up to 8 channels of audio shall be multiplexed on either a style 4 or style 7 twisted pair.
 - d. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.
 - e. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.
 - f. When required, Redundant Voice Command Centers shall be capable of generating voice paging from more than one node in a network audio system.

2.3 FIRE ALARM SYSTEM POWER SUPPLIES

A. System primary power:

- 1. Primary power for the FACP and the secondary power battery chargers shall each be obtained from the power panel board. Circuit breakers shall be fitted with a suitable guard, requiring removal of a screw to open, and used only for fire alarm.
- 2. The power supply and battery charging shall be provided by the power supply interface board and power supply module.
- 3. A fusible double throw AC power disconnect switch, lockable in the open and closed positions shall be provided adjacent to the Fire Alarm Control Panel.

B. Secondary power supply:

- 1. Provide sealed gelled electrolyte batteries as the secondary power supply for the fire alarm control panel and each system circuit interface panel. The battery supply shall be calculated to operate its load in a supervisory mode for 24 hours with no primary power applied and, after that time, operate its alarm

mode for five minutes.

2. Provide battery charging circuitry for each standby battery bank in the system low voltage power supply or as a separate circuit. The charger shall be automatic in design, adjusting the charge rate to the condition of the batteries. Battery charge rate and terminal voltage shall be read using the fire alarm control panel LCD display in the service mode, indicating directly in volts and amps.

2.4 SAFELINC INTERNET MODULE

- A. Furnish as a part of the installed system, a 4100-6060 SAFELINC INTERNET MODULE. Furnish and install (2) CAT5 cables from main FACP to designated MDF/IDF location as depicted on drawings.

2.5 AREA AND SPOT DETECTION

- A. Furnish and install Simplex, Photoelectric True Alarm Smoke Sensors, with Simplex True Alarm Detector Bases.
- B. General:
 1. Common base for detachable, low profile, photoelectric type smoke, and heat detector heads.
 2. Monitoring: FACU shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
 3. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
 4. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
 5. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
 6. Environmental Compensation: The FACU shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
 7. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACU.
 8. Sensitivity Testing Reports: The FACU shall provide sensor reports that meet NFPA 72 calibrated test method requirements.
 - a. Reports shall be capable of being printed for annual recording and logging of the calibration maintenance schedule.

- b. Where required, reports shall be accessible remotely through:
 - 1) A Fire Panel Internet Interface using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3. The Fire Panel Internet Interface shall be capable of automatically scheduling email reports to individual user accounts on a weekly, bi-weekly, or monthly schedule
 - 2) A PC Annunciator using an RS232-C connection to the FACU or a PC Annunciator Client using a TCP/IP communications protocol connection to the PC Annunciator server compatible with IEEE Standard 802.3.
- 9. The FACU shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACU as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACU and subsequently a system trouble is reported to the Supervising Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
- 10. The FACU shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
- 11. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
- 12. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
- 13. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.
- C. Photoelectric type area smoke detector:
 - 1. LED light source, silicon photodiode receiving element. Line filter and time delay circuitry to prevent transient false alarms.
 - 2. 360-degrees smoke entry, locking tamper screw, pulsating on power LED indicator, UL 268.
- D. Area heat detector:
 - 1. 135-degrees fixed temperature self restoring type.
 - 2. Locking tamper screw, UL 521.

3. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermostat-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
4. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACU for either 15-deg F or 20-deg F per minute.
5. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.6 ADDRESSABLE MODULE

- A. Furnish and install Simplex Individual Addressable Module(s)

2.7 MANUAL STATIONS

- A. Provide and install Simplex Addressable Manual Pull Stations Single Action, with Individual Addressable Modules and Back Box for Pull Stations. All except the Master pull stations shall be provided with an additional cover box. Manufactured by Signal Communications Corp. Front Cover Model NO.ST-FRCO1, Extender Model NO. ST KTRO1 or approved equal.

2.8 BEAM DETECTORS

- A. Separate transmitter and receiver units, UL 268.
- B. Microprocessor based, temperature compensated, automatic gain control, field-adjustable beam obscuration sensitivity, adjustable optics, auxiliary contacts, tamper switch, red LED alarm indicator, and yellow LED trouble indicator.
- C. Provide a remote indicator/test unit.

2.9 DUCT TYPE SMOKE DETECTION

- A. General:
 1. Common base for detachable ionization or photoelectric type smoke detector head.
 2. Duct housing with hinged door and full length sampling tube. Visible alarm LED, remote LED output, UL 268A.
 3. Provide auxiliary contacts.
 4. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
 5. Duct Housing shall provide a relay control trouble indicator Yellow LED.
 6. Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
 7. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation

- of the duct smoke sensor.
- 8. Duct Housing shall provide a magnetic test area and Red sensor status LED.
- 9. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover

B. Photoelectric type area smoke detector:

- 1. LED light source, silicon photodiode receiving element. Line filter and time delay circuitry to prevent transient false alarms.

C. Remote alarm indicator:

- 1. Ceiling mounted, red LED, stainless steel faceplate engraved ALARM. Provide where duct type smoke detectors are installed above a ceiling.

2.10 ADDRESSABLE TRANSMITTERS/MONITOR MODULES

- A. Addressable transmitters/monitor modules shall be provided where required to interface with contact alarm devices.

2.11 ADDRESSABLE RELAY MODULES

- A. Addressable relay modules shall be provided where required to provide audible alarm interface and/or relay control interface.

2.12 ADDRESSABLE TRANSMITTERS/MONITOR/CONTROL MODULES

- A. Addressable Dual point Multi-state input and relay output modules shall be provided where required to interface with tri-state alarm devices.

2.13 DOOR HOLDERS

- A. Door Holders shall be Edwards Signaling type and shall be 24VDC with operating power provided by the FACP.
- B. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall operate from a 120VAC, a 24VAC or a 24VDC source, and develop a minimum of 25 lbs. holding force.
- C. Material and Finish: Match door hardware.

2.14 TAMPER SWITCH

- A. Tamper switch with Individual Addressable Module.

2.15 FLOW SWITCH

- A. Flow switch with Individual Addressable Module.
- B. System software programming shall be performed by Simplex/Grinnell. Other vendor programming of system software is not permitted.

- C. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to the approval of the District's Electrical Engineer.

2.16 EVACUATION SIGNAL

- A. Furnish and install where show on the drawings, audible and /or visual signals, Simplex type audio visual devices with the following characteristic and capacities:
 - 1. Electronic horn model series with a sound rating of 90 dba and temporal pattern per code and speaker per code, and a strobe light with an intensity of 15, 75, and 110 candela (where required) Provide and install factory-manufactured red-painted steel wireguard to protect unit(s) in boys and girls bathrooms areas subject to vandalism, mount exterior horns in weather proof enclosures.
 - 2. Visual alarm signals model 15, 75 and 110 series shall be furnished with minimum light intensity of 15, 75, and 110 candela complying with the ADA act and the following requirements:
 - a. Xenon strobe with a minimum repetition rate of 1HZ, not exceeding 2 HZ and maximum duty cycle of 40% with pulse duration of .2 seconds.
 - b. Provide factory-made re-painted steel wire-guard to protect strobe.
 - 3. If more than one strobe in one room or area, all strobes shall be synchronized.

PART 3 – EXECUTION

3.1. INSTALLATION, GENERAL

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - 1. Factory trained and certified personnel.
 - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level III certified personnel.
 - 3. Personnel licensed or certified by state or local authority.

3.2. EQUIPMENT INSTALLATION

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

- B. Existing Fire Alarm Equipment shall be maintained fully operational until the new equipment has been tested and accepted.
- C. Equipment Removal: After acceptance of the new fire alarm system, disconnect and remove the existing fire alarm equipment and restore damaged surfaces. Package operational fire alarm and detection equipment that has been removed and deliver to the Owner. Remove from the site and legally dispose of the remainder of the existing material.
- D. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.
- E. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

3.3. WIRING INSTALLATION

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AH) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electrical Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

3.4. TEST/FIELD QUALITY CONTROL

- A. The DISTRICT team shall be notified 72 hours prior to any and all acceptance testing of alarm systems, so monitoring of the fire alarm system can be initiated, and DISTRICT team shall be scheduled to attend the testing. The contractor will pay for expenses at \$100/hour/person attending a final test should more than three devices fail.
- B. Prior to the final acceptance test, the Contractor shall perform a complete pre-test with the fire alarm vendor, the District's fire alarm technicians and their fire alarm consultant. The pre-test shall be for all fire alarm equipment and testing records of the pre-test shall be provided to ensure a successful final acceptance test. As part of the completion of work on the fire alarm systems, a full documented test of all the components of the fire alarm system shall be performed. A representative from the DISTRICT team shall be present for the test. Any deficiencies reported by the district representatives and/or district consultant shall be corrected and re-tested prior to calling for the final inspection.

- C. A report certifying that the installation is complete, pre-tested, and fully operational shall be developed and forwarded by the fire alarm technician to the DISTRICT Project Manager. The final acceptance test will not be scheduled until the pre-test documentation and NFPA 72, Record of Completion have been submitted to the DISTRICT project Manager.
- D. The Contractor, DISTRICT team, the PI and an authorized representative from each supplier of equipment shall be in attendance at the final acceptance test to make necessary adjustments. The final test shall include, but not be limited to:
 - 1. Activation of all initiating devices.
 - 2. Activation of every sprinkler control and monitoring device, with a test of the time of activation.
 - 3. Activation and visual check of every notification appliance device.
 - 4. Activation of all fire alarm controlled components. These shall include, but not be limited to, magnetic door holders, fan shutdowns, elevator recall, etc.
 - 5. A test of the system for electrical supervision, including detection of ground faults of the 24 VDC system(s).
 - 6. The system(s) shall be placed on battery power for 24 hours before the scheduled acceptance test, so that the system can be verified for 24 hours of standby power and 15 minutes of notification signal operated on battery power.
 - 7. Confirmation that the dialer is receiving all required signals and that all points are reporting off-site in the correct manner.
- E. The Contractor shall pay all overtime fees required by the PI and DISTRICT personnel for witnessing the acceptance test.
- F. After the final acceptance, the NFPA 72, Record of Completion shall be signed by the PI, installing contractor and a factory certified technician, certifying that the fire alarm system has been installed, tested and will function in accordance with the manufacturer's specifications and the DISTRICT'S requirements.
- G. Although acceptance testing is only for the portion of the school fire alarm system associated with the project, if any existing fire alarm signaling, notification or control circuit has been disrupted, then the contractor shall be responsible for testing 10 percent of the existing field devices to assure the PI and the DISTRICT team that the existing devices are functional. The 10% test should include 10% of the existing initiating devices and 10% of the existing notification devices. If any of the ten percent devices fail, only the repaired devices need to be re-tested after they are repaired or replaced.
- H. If the fire alarm installation or modification is in "phased" stages or if there are substantial corrections and additions to the scope of the project, then the contractor shall assume responsibility for subsequent testing and retesting of the fire alarm system installation. After the last phase of the fire alarm system has been completed and tested totally, ten percent of the previously completed phases are to be tested with the final tested phase.
- I. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

- J. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
1. Factory trained and certified.
 2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 3. International Municipal Signal Association (IMSA) fire alarm certified.
 4. Certified by a state or local authority.
 5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- K. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- L. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
- M. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
- N. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- O. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- P. Final Test, Certificate of Completion, and Certificate of Occupancy:
1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.5. CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.6. TRAINING

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
 - 1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
 - 2. Schedule training with the Owner at least seven days in advance.

END OF SECTION

09/21/18

SECTION 31 10 00

SITE PREPARATION & PLANT PROTECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Protecting improvements and vegetation to remain.
- B. Clearing and grubbing.
- C. Removal of existing site improvements including but not limited to concrete, utilities, curbs, fencing, and irrigation system.
- D. Preserve and protect adjoining properties during removal work, site preparation work and construction. Preserve and protect existing trees, shrubs and other improvements and adjoining properties during removal work, site preparation work and construction.
- E. Generally, this project includes construction of new building and associated improvements including but not limited to: Protection of existing improvements, demolition, staking, site preparation, storm drainage, earthwork, concrete work, asphalt work, site furnishings, irrigation, and all reasonably incidental and related work as shown on plans and as specified.

1.2 QUALITY ASSURANCE

- A. Stipulations – Site Preparation and Demolition:
 - 1. Work is in accordance with the Drawings and specifications and includes but is not necessarily limited to the following:
 - a. Clearing and grubbing.
 - b. Identification and protection of vegetation indicated to remain.
 - c. Removal of existing site improvements, such as, paving and bases, concrete curbs, fences, footings, foundations, irrigation system, underground pipes and utilities and structures.
 - 2. Locate and identify existing utility services and protect or disconnect, remove and cap as required for new work.
 - 3. Remove, clean, store and protect all items designated and directed to be salvaged to Owner.
 - 4. Remove, store and protect all items designated and directed to be reinstalled.
 - 5. Obtain and pay for permits required for execution of this work.
- B. Review:
 - 1. Contractor shall review and identify with the Owner's Representative the limits of Work and extent of site preparation and plant materials to be protected.
 - 2. At the Owner's discretion, an Arborist may represent the Owner to review the work of the Contractor in regards to plant protection.

C. Plant Protection:

1. Protect trees against cutting, breaking, skinning and bruising of bark; permit no traffic or stockpiling within drip line.
2. Do not change earth surface within drip line of trees.
3. Do not park vehicles or store materials, supplies and construction equipment within drip line of trees.
4. Install a temporary 4-foot high orange plastic fence typically at the "drip line" of the tree(s) except as otherwise directed by the Arborist / Owner's Representative.
5. Obtain specific instruction from Arborist / Owner's Representative for pruning of trees, shrubs, roots or disturbance of soil within spread of tree branches.
6. Note that trees vary greatly in their tolerance of root pruning from the high tolerance of Redwoods to the medium tolerance of Pittosporum to the low tolerance of Buckeye. Generally cutting of roots three inches or greater shall be avoided. Roots one inch and greater in diameter that must be cut shall be cut cleanly and obliquely with the cut surface facing down.
7. Exposed and pruned roots shall be covered with light well-drained soil backfill and mulch over. The area shall be kept moist.
8. Any trenching required within the root zone shall be done by hand and as directed by the Arborist / Owner's Representative.
9. Provide periodic watering for all planting within Contract limit and any adjacent areas affected by the work as accepted by the Owner's Representative.

D. Plant Replacement:

1. See notes on plan

E. Work Included:

1. Coordinate shutoff of irrigation systems with the Owner and be responsible for any damage caused to adjacent landscaping by Contract work.
2. Site Preparation and Demolition
3. Work is in accordance with the Drawings and specifications and includes but is not necessarily limited to the following:
 - a. Clearing and grubbing.
 - b. Identification and protection of vegetation indicated to remain.
 - c. Removal of existing site improvements, such as paving, curbs, gutters, fences, structures, slabs, foundations and walls.

F. Locate and identify existing utility services and disconnect, remove and cap.

G. Remove, store and protect all items designated and directed to be reinstalled.

H. Obtain and pay for permits required for execution of this work.

1.3 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of adjacent streets, adjacent parking areas, trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site demolition.
- B. The Contractor is to submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the Environmental Safety Policy of the School District.
- C. Record Drawings: Indicate points of disconnection and capping, abandonment and removal of existing utility services; include utility names, sizes and locations, relationship to

permanent structures located on site and on adjacent property, and certificates of severance of utility services from respective utility companies or owners. Submittals to be as specified in Sections 01 33 00.

1.4 PROJECT CONDITIONS

- A. Coordination: Coordinate this work with the work of other Sections to avoid delay and interference with other work. Refer to the Demolition Plan for site work requirements.
- B. Nuisances: Keep dirt, dust, noise and other objectionable nuisance to a minimum. Use temporary enclosures, coverings and sprinkling, and combinations thereof, as necessary to limit dust to lowest practicable level, except do not use water to the extent that it causes or contaminated run-off.
- C. Traffic: Conduct work to ensure minimum interference with vehicular and pedestrian traffic, and to permit unencumbered access to the school property located outside of the project areas including the track and field.
 - 1. Do not close or obstruct streets, sidewalks, or other public passageway without permission from authorities having jurisdiction.
 - 2. If required, by governing authorities, provide alternate routes around closed and obstructed traffic ways.
 - 3. Do not drive any type of vehicle or store products on the existing track surfacing or on asphalt that is curing unless the area has been protected per California Track instructions. Vehicles and storage areas are limited to the areas of thickened asphalt pavement section as shown on the drawings or as designated by the District Representative. Protect existing track surfacing per manufacturer's instructions. Submit a protection plan to the District for approval prior to start of demolition work.
- D. Dispose of cleared, grubbed, and removed material that will not be salvaged or recycled on Site.
- E. Salvable Improvements: Carefully remove items indicated to be salvaged and store where designed by the District Representative. Avoid damaging salvage material.
- F. Protections:
 - 1. Prevent movement and settlement of adjacent structures. Install temporary barriers, fences, guard rails, enclosures, shoring, bracing, planking, warning signs and other protections required to protect structures, utilities, landscaping and other items that are to remain in place.
 - 2. Protect benchmarks, monuments and reference points from displacement and damage; and if displaced or damaged, replace at no cost to the Owner.
 - 3. Install and maintain required bracing, shoring and supports when removing structural elements and be responsible for safety and support of structure. If safety of structure appears to be endangered, cease operations and immediately notify the District Representative. Do not resume operations until safety is restored.

PART 2 - PRODUCTS

2.1 SOILS MATERIALS

- A. Satisfactory Soil Materials. See Section 31 20 00, Earthwork for satisfactory soil material for backfilling excavations and depressions resulting from site clearing.

2.2 PROTECTIVE FENCING

- A. Protective Fencing: As accepted by Owner's Representative and as specified herein.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas in which work is to be performed. Report in writing to the District's Representative all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting work constitutes acceptance of the existing conditions and the Contractor shall then, at his expense, be responsible for correcting unsatisfactory and defective work encountered.
- C. For the duration the project, provide a construction fence at the perimeter of project(s) as required to secure the project from trespass and provide a safe construction site. Field verify the perimeter and gate locations with the Construction Manager. The fence location may be adjusted as the project progresses based on the approval of the District's Representative.
- D. Install and maintain temporary fencing and other required protective devices and exclude construction activities from tree/shrub zones except as supervised by the Arborist / Owner's Representative.
- E. If access to tree/shrub zones cannot be avoided an intact four inch layer of mulch with minimum 1.25 inch thick, metal strap linked plywood shielding shall be maintained in the tree/shrub zone where heavy equipment will be operated.

3.2 CLEARING

- A. Remove designated trees, stumps, rubbish, undergrowth and deadwood as well as fences and incidental structures that interfere with the construction as shown on the Drawings and as specified. Obtain verification from project inspector prior to removal.
- B. Field Verification: Before removing non-designated trees, shrubs, stumps, bushes, vines, rubbish, undergrowth and deadwood as shown on the Drawings and as specified, obtain verification from Owner's Representative.
- C. Remove non-designated trees, shrubs, stumps, bushes, vines, rubbish, undergrowth and deadwood as well as fences and incidental structures that interfere with the construction as shown on the Drawings and as specified. Obtain verification from Owner's Representative prior to removal.
- D. Backfill holes resulting from plant and structures removal with clean fill compacted to minimum 90% relative compaction, except as required elsewhere to a greater degree by Civil or Structural Engineer.

3.3 GRUBBING

- A. Remove all stumps and roots in their entirety, brush, organic materials and debris to bare earth except where otherwise required. Tree trunks shall be removed minimum depth of 2 feet below existing grade or finish grade, whichever is deeper. Roots of trees and shrubs shall be removed a minimum depth of 12 inches below existing grade or finish grade, whichever is deeper. When indicated, such materials as topsoil and leaf mold, or other organic materials above the ground surface suitable for use as mulch or topsoil, shall be salvaged and stockpiled.
 - B. Remove grasses and weeds. Apply systemic weed killer and confirm weed kill prior to removal.
 - C. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with Earthwork Specification for backfill materials, compaction and installation methods. In planting areas backfill holes with clean approved planting soil compacted to 90% relative compaction to a minus 12 inches below finish grade and 85% relative compaction for the top 12 inches. When indicated, such materials as topsoil and leaf mold, or other organic materials above the ground surface suitable for use as mulch or topsoil, shall be salvaged and stockpiled.
 - D. Remove existing pavement within proposed planting areas in its entirety, including baserock.
 - E. Remove existing pavement within proposed pavement areas to a depth sufficient to allow for the construction of the proposed pavement to the grades shown. Existing base material may be left in place and re-compacted as required where not conflicting with the new pavement section.
- 3.4 TOPSOIL STRIPPING – As required
- A. Coordinate with Section 31 20 00, Earthwork, and Drawings; Strip topsoil to required depths in a manner to prevent intermingling with underlying subsoil or other waste materials.
- 3.5 UTILITIES
- A. Contract local utility companies 48 hours minimum prior to start of demolition work. Confirm verbal notices and written notices. Verify locations of all utilities entering site and their locations on site.
 - B. Cooperate with the District's Representative, utility companies, adjacent property owners, and other building trades in maintaining, protecting, re-routing or extending utilities passing through work areas which serve structures located on project site and on adjacent properties.
 - C. Verify that utilities that are to be removed, capped or abandoned are turned off, or are disconnected, or are re-routed to new locations before starting demolition.
- 3.6 REMOVAL
- A. General:
 - 1. Remove materials in an orderly and careful manner.
 - 2. Repair or replace all removal work performed in excess to that required at no cost to the District. Repair or replacement shall match and equal construction, condition and finish existing at time of award of Contract.

- B. Remove the following from locations to the extent required or directed for new construction. Removal of slabs and other structures shall include their footings and foundations. Removal of pavements shall include base rock and sub-structures.
1. Fencing, including posts, fabric and footings. Backfill voids if required from removed footings with clean fill as defined in Section 31 20 00, Earthwork. Be careful of soil caving due to presence of groundwater intrusion.
 2. Electric underground wires and conduits occurring within removal areas except those shown as reused on Electrical Drawings. Refer to Utility Drawings and Specifications.
 3. Miscellaneous structural elements that interfere with the new construction as directed.
 4. Paving: remove asphalt and concrete paving including aggregate base rock completely to the minimum depth required for subgrade of new improvements. Dispose of demolished concrete, asphalt and base rock at a material recycling facility. Existing aggregate base may be reused on site if it meets requirements of 31 23 23 fill and the approval of the Geotechnical Engineer.
 5. Underground pipes and utilities.
 6. Other items noted on the drawings and required to be removed to install the new improvements.
 7. Slabs, equipment pads and sidewalks.
 8. Electric utility poles, wires and down guys, including all underground wires and conduits occurring within removal areas.
 9. Designated utility services occurring within removal areas, including disconnection, capping and complete removal or abandonment.
 10. Buried tanks, complete with piping, footings, leach fields and foundations.
 11. Trees and their roots to a minimum of 30 inches below existing grade..
 12. Miscellaneous structural elements which interfere with the new construction and as directed by the Owner's Representative.
- C. Cutting asphalt, concrete curbs and concrete pavement:
1. All lines shall be marked and accepted by District's Representative before the cutting operation.
 2. Cut edges of pavement at 90-degree angle to the surface in a true and straight line in accordance with dimensions shown on the Drawings. Make cuts with a concrete saw, to 1-1/2" minimum depth.
- D. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with requirements specified for backfill materials, compaction and installation methods.
- E. Rough grade site within removal areas to meet adjacent contours and to provide positive drainage. Leave site in clean condition acceptable for performance of subsequent construction operations.

3.7 CLEANUP AND DISPOSAL, per Section 01 74 19 and Section 01 77 00:

- A. Transport trash, rubbish and debris daily from site and legally dispose of:
 - 1. Demolish and waste materials encountered.
 - 2. Remove and promptly dispose of contaminated, vermin-infested and dangerous materials encountered.
 - 3. Do not burn or bury materials on site.
- B. Clean excess soil may be distributed on site as accepted by the Project Inspector site as accepted by Engineer, if it does not adversely affect specified finish grades. Coordinate with Section 31 20 00 Earthwork, Drawings and, Subgrade Preparation & Base Material.
- C. Excess soil may need to be legally disposed of off site. Refer Existing Conditions. Coordinate with Section 31 20 00, Earthwork, Drawings
- D. Upon completion of work under this Section, remove all tools, equipment and temporary enclosures and structures.

END OF SECTION

08/27/18

SECTION 31 20 00

EARTHWORK

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide earthwork complete, including removal work and clearing, grading, excavating and fill, and dewatering.

1.2 REFERENCE STANDARDS

- A. Perform work in compliance with the rules and regulations of the Division of Industrial Safety and other local State agencies having jurisdiction. Nothing contained herein shall be constructed as permitting work that is contrary to such rules, regulations, and codes.
- B. Perform all work in accordance with all applicable laws, codes and regulation required by the State of California,
- C. Comply with the State Water Resources Control Board.
- D. Work shall conform to local codes and regulations.
- E. References to "Standard Specifications" shall mean the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, Cal Trans.
- F. ASTM Standards.
- G. Relative compaction refers to the in-place dry density of the same soil expressed as a percentage of the maximum dry density of the same soil determined by ASTM D1557 laboratory test procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density as determined by the same procedure.

1.3 SUBMITTALS, per Section 01 33 00

- A. Submit a list of grading equipment to be used.
- B. Submit an analysis of physical and chemical properties and certificate of compliance of environmental clearance for import soil.
- C. Before the grading operation is underway, submit a letter identifying the approximate quantities and type of soil required to be imported and exported in order to accomplish a balance of the earthwork materials without additional compensation.
- D. The Contractor is to submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the Environmental Safety Policy of the School District.

1.4 CLOSEOUT SUBMITTALS

- A. The Contractor shall engage a California Registered Civil Engineer or licensed Land Surveyor to perform a conformance survey at completion of the project and provide a hard copy of the survey and an AutoCAD copy of the survey as part of the closeout documents.

1.5 SOILS REPORT

- A. A Geotechnical Evaluation and Geologic Hazard Assessment report has been prepared for the project by the firm: A3GEO Inc. on February 16, 2018. Refer to Document 00 31 32 – Geotechnical Data.
- B. This report is available in the office of the Owner's Representative for inspection by the Contractor. Unless otherwise specified, it is intended that all earthwork be performed in accordance with the provisions of this report.

1.6 SOILS BORINGS

- A. Subsurface soils investigations have been made at the site and logs of the test holes are available in the Soils Report. Such investigations have been made for the purposes of design only, and neither the Architect, the Owner, nor the Soils Engineers guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. Such information is made available for general information only and shall not relieve the Contractor of the responsibility for making his own investigations.

1.7 PROJECT CONDITIONS

- A. Coordination: Coordinate this work with the work of other Sections to avoid delay and interference with other work. Refer to Section 01 11 00 "Summary of Work" for site work sequencing requirements.
- B. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.
- C. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.
- D. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair at Contractor's expense.
- E. Promptly notify the Inspector of unexpected subsurface conditions.
- F. If during the course of the earthwork operations, an area of pumping or otherwise unstable soil is encountered, the contractor shall immediately modify his operations in such a way as to limit the frequency and weight of vehicles traveling over the area and promptly notify the Inspector who will contact the Geotechnical Engineer for an evaluation.

1.8 EXISTING CONDITIONS

- A. A topographic survey of the property has been included in the drawings for reference only. Upon the beginning of the earthwork, Contractor represents that he has inspected the site and satisfied himself as to actual grades and levels and the true conditions under which tie work is to be performed.

1.9 PROTECTION

- A. Furnish, place and maintain all supports, shoring and sheet piling which may be required for the earthwork operations.
- B. Maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.
- C. Adequate protection measures shall be provided to protect workmen, passers-by, and the site. Streets and adjacent property shall be fully protected throughout the operations.
- D. In accordance with generally practiced construction practices, the Contractor shall be solely and completely responsible for working conditions on the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.
- E. Any construction review of the Contractor's performance conducted by the Inspector is not intended to review the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Adjacent streets, sidewalks, and property shall be kept free of mud, dirt, or similar nuisances resulting from earthwork operations.
- G. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas.
- H. Water as required to suppress dust nuisance.
- I. Protection of Existing Improvements:
 - 1. Provide barricades, covering, or other types of protection necessary to prevent damage to existing improvements indicated to remain in place. Protect improvements on adjoining properties. Repair damaged existing improvements to original condition as approved by authority having jurisdiction.
- J. Provide erosion control measures as required.
- K. Protection of Other Property: Excavation and other work over, under and adjacent to existing pipelines, cables, conduit ruins or structures of any kind shall be procured in such a manner as not to interfere with the safe operation and use of such installations. Should any damage be incurred to existing facilities during the Contractor's operations, the Contractor shall immediately notify the Owner's Representative and authorities, and shall arrange for the immediate repair of same at his expense.
- L. Underground Obstruction: The locations of existing underground utilities and structures, insofar as that are known from information furnished by the respective utility companies and agencies, have been shown on the drawings. The Owner assumes no responsibility for the accuracy or completeness of the said data, which is offered solely for the convenience of the Contractor.
- M. Control of Water: Take measures as may be required and furnish, install and operate such pumps or other devices as may be necessary to remove any seepage, storm water, or sewage that may be found or may accumulate in the excavations during the progress of the work. Keep excavations entirely free from water at all times during the progress of the work, and until the Geotechnical Engineer gives permission to cease pumping.
- N. Pavement Restoration: Pavement, bases and compacted subgrade disturbed by the trenching operations shall be replaced in an acceptable manner with materials equal to

the adjacent compacted subgrade, bases and pavement for a minimum of 12" on each side of the trench, and shall conform to the requirements of these Specifications or to local ordinances governing such replacement.

1.10 QUALITY ASSURANCE

- A. Contractor shall provide adequate notice, cooperate with, provide access to the work, and assist testing agency and their representative in the execution of their function.
- B. When, during the progress of work, field tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or remove and replace defective materials with new materials as directed by the Inspector. Costs of additional labor, materials, and testing to attain specified density at Contractor's expense.
- C. The Contractor shall engage a California Registered Civil Engineer or licensed Land Surveyor to perform field engineering.
- D. The Contractor shall engage a California Registered Civil Engineer or licensed Land Surveyor to perform a conformance survey at completion of the project and provide a hard copy of the survey at completion of the project and an AutoCAD copy of the survey as part of the closeout documents.
- E. Perform all grading with hydraulically laser controlled grading machinery.

1.11 TESTING

- A. Testing and Inspection: Testing shall be performed by a qualified independent testing laboratory under the supervision of a registered professional engineer, specializing in soils engineering.
- B. The Owner will direct, provide, and pay for initial testing and inspection during earthwork operations.
- C. Provide and pay for re-testing and inspection during earthwork operations. Laboratory and inspection service shall be acceptable to the Owner.
- D. Where reference is made to relative compaction, it shall be in the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, determined by the ASTM D1557 laboratory test procedure. Optimum moisture is the water content that corresponds to the maximum dry density.
- E. For structural fills under footings, slabs or pavements. determine moisture density relationships in accordance with ASTM D1557.

PART 2 - PRODUCTS

2.1 FILL

- A. Structural Fill Materials: Inert subsoil material free of organic matter, rubbish, debris, and rocks greater than 3" diameter, and meeting the following requirements:
 - 1. Liquid limit of less than 40.
 - 2. Plastic index of less than 15, per ASTM D4318.

3. Minimum laboratory dry weight at optimum moisture content of 110 pounds per cubic foot.
4. Provide imported fill material as required to complete the work. Obtain rights and pay all cost for imported materials.
5. Proposed fill material shall be inspected, tested, and laboratory report issued prior to use in the work.
6. Suitable excavated material removed to accommodate new construction may be used as fill material subject to inspection and approval.
7. All fill material is subject to testing and inspection by the Geotechnical Engineer.

B. Filter Materials:

1. Drain Rock: Per Section 31 23 33.
2. Angular Washed Sand: Per Section 31 23 33.

2.2 TOPSOIL

- A. Topsoil is defined as on-site surface soil. Satisfactory topsoil shall be free of subsoil, clay, lumps, stones, and other objects over 1/2" in diameter, without any weeds, roots and other objectionable material.
- B. If herbicide contamination is suspected, then a radish/ryegrass growth trial must be performed. Consult with Inspector prior to decision to test or not.

2.3 SOIL STERILANT

- A. Sterilizer shall be approved by a weed and grass killer that is quick acting, short lived, nonselective, and not dangerous to installer.
- B. The Contractor is to submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the Environmental Safety Policy of the San Rafael City Schools District.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.
- B. Do not cover or enclose work of this Section before obtaining required inspections, tests, approvals and location recording.

3.2 EXISTING UTILITIES

- A. Notify the Underground Service Alert (U.S.A.) Center 48 hours in advance of performing any excavation works by calling (800) 227-2600. Verify the grade and location of existing

utilities prior to any work where conflicts may arise by careful hand digging. Be responsible for the protection of all existing utilities. Be responsible for the protection of all existing survey monuments.

- B. Before starting grading and excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform the excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the work progresses.
- C. Maintain, protect, relocate or extend as required, existing utility lines which pass through the work area. Pay costs for this work, except as covered by the applicable utility companies.
- D. Protect active utility services uncovered by excavation.
- E. Remove abandoned utility service lines from the area of excavation. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers.
- F. Accurately locate and record abandoned and active utility lines rerouted or extended on project record documents.

3.3 SITE GRADING

- A. Perform grading within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide subgrade surfaces parallel to finish surface grades. Provide uniform levels and slopes between new elevations and existing grades.
- B. Grade surfaces to assure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes and as follows:
 - 1. Rough Grading: Plus or minus 0.10 ft. subgrade tolerance. Finish required will be that ordinarily obtained from a laser controlled blade grader operations.
 - 2. Provide subgrade surface free of exposed boulders or stones exceeding 3" in greatest dimension in paved areas, 1" in athletic field areas.
 - 3. Subgrade: Grade subgrade surface smooth and even, free of voids to the required subgrade suitable to receive granular base materials. Refer to Section 31 20 00.
 - 4. Drainage Swales: Grade as shown on drawings.

3.4 EXCAVATING

- A. Excavate for structure to elevations and dimensions shown. Extend excavation a sufficient distance from foundations to permit placing and removal of formwork, installation of materials, services and inspection. Hand trim foundation excavations to final grade just before concrete is placed. Remove loose, soft materials, and all organic matter. Footings shall bear on approved undisturbed bearing soil.
- B. Obtain inspection and testing of foundation excavations by the inspector before concrete is placed.
- C. Excavate for structures and paving to cross-sections, elevations and grades indicated. Allow for base material.

- D. Extra Excavation: Excavate unsatisfactory soil materials extending below required elevations to depth as directed. Such extra excavation will be paid for as a change in work. Obtain Architect's written authorization before performing extra excavation work.
- E. Unauthorized excavation: Backfill and fill all overexcavation to proper grades. Fill overexcavation at footings with 1,500 psi concrete. Additional labor and material for unauthorized excavation and remedial work at Contractor's expense.
- F. Shore, sheet or brace excavations as required to maintain them secure. Remove shoring and bracing as backfilling progresses, when banks are safe against caving.
- G. Do not excavate footings or slabs to the full depth when freezing temperature may be expected, unless footings or slabs are placed immediately after the excavation has been completed. Protect excavation bottoms from freezing when the placing of concrete is delayed.
- H. Rock Excavating:
 - 1. Rock: Material which cannot be removed with 3/4 cu. yd. capacity power shovel without drilling or solid boulders with a volume of more than 1/2 cu. yd.
 - 2. Rock Excavation: Material excavation of buried boulders and rock in excess of 1/2 cu. yd. that requires continuous use of ripper or other special equipment. All other excavation shall be classified as earth excavation.
 - 3. Contractor will be paid cost of rock excavation as a change in work. Obtain Inspector's written authorization prior to performing rock excavation work.

3.5 BACKFILLING

- A. Obtain inspection and approval of subgrade surfaces by Inspector prior to filling operations. Scarify, dry and compact soft and wet areas; remove and replace unsuitable subgrade materials with an approved compacted fill material. Take corrective measures before placing fill materials.
 - 1. Topsoil is not permitted as fill or backfill material under paved areas.
 - 2. Scarify the upper 6 inches of existing soil before placing any fill. In areas on which concrete, aggregate base, is to be placed, moisture condition and thoroughly mix the scarified material and re-compact to at least 90 percent relative compaction.
- B. Spread approved engineered fill material uniformly in layers not greater than 6" of loose thickness over entire area prior to compaction. Request monitoring of filling and compaction by Geotechnical Engineer.
 - 1. Lift thickness requirements may be modified by Inspector to suit equipment and materials or other conditions when required to assure Inspector's satisfaction.
 - 2. Moisture-condition fill material to near Optimum Moisture Content by aerating or watering and thoroughly mix material to obtain moisture content permitting proper compaction.
 - 3. Place and compact each layer of fill to indicated density before placing additional fill material repeat filling until proposed grade, profile or contour is obtained.
 - 4. Suspend fill operations when satisfactory results cannot be obtained because of environmental or other unsatisfactory site conditions. Do not use muddy (or frozen) fill materials. Do not place fill material on muddy (or frozen) subgrade surface.

5. Maintain surface conditions which permit adequate drainage of rainwater and prevent ponding of surface water in pockets. When fill placement is interrupted by rain, remove wet surface materials or permit to dry before placing additional fill material.
- C. Place backfill materials in uniform layers not greater than 6" loose thickness over entire backfill area.
1. Use hand tampers at foundation retaining walls and similar locations. Do not use large rolling equipment adjacent to retaining walls.
 2. Do not backfill against retaining wall until walls for bearing surfaces have reached design strength or are properly braced, and backfilling operations approved. Provide clean backfill materials or granular materials as required; compact in maximum 6" layers.
- D. Fill all areas of settlement to proper grade before subsequent construction operations are performed.
- E. Compaction:
1. Provide minimum and maximum compaction control for all fill and backfill.
 2. Engineered Fill
 - a. Compact each layer of engineered fill or backfill material to 90% relative compaction, unless otherwise specified. Extend compaction at last 5'-0" at both sides of foundations and retaining walls and at least 1'-0" beyond slabs on-grade and paving.
 3. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.
 4. Maintain moisture content of materials during compaction operations within required moisture range to obtained indicated compaction density.
 5. Provide proper equipment to achieve consistent and uniform compaction of fill and backfill materials.
 6. Do not use heavy equipment that will over-compact planting soil. Compact topsoil to maximum 85 % relative compaction.
- F. Maintenance of Finished Grades:
1. Protect finished graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and damaged areas.
 2. Where completed areas are distributed by construction operations or adverse weather, scarify, reshape, and compact or scarify to achieve required density.

3.6 FIELD QUALITY CONTROL

- A. The Owner will provide and pay for field quality control soils testing and inspection during earthwork operations.
- B. Contractor shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist testing agency and their representatives in execution of their function.

- C. Fill Materials: The Owner will test proposed materials to verify suitability for use, gradation of material, moisture-density relation, design bearing value, and percent of materials.
- D. Subgrade Surfaces: Based on visual examination of the site, the Owner will provide and pay for bearing tests as required to verify subgrade surfaces are adequate and meet or exceed design bearing values.
 - 1. Paved Areas: Make at least one test for each 2,000 sq. ft. of paved area.
- E. Compaction Operations: The Owner will provide and pay for inspection and testing during paved area filling and compaction operations. Test each lift of fill to verify compaction meets specified requirements. The Owner will provide and pay for periodic inspection and testing during site area filling and compaction operations.
- F. When, during progress of work, filed tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or remove and replace defective materials with new materials as directed by the inspector. Cost of additional labor, materials, and testing to attain specified density is at Contractor's expense.

3.7 DISPOSAL OF WASTE MATERIALS

- A. Stockpile, haul from site, and legally dispose of export and waste materials, including trash and debris.
- B. Maintain disposal route clear, clean, and free of debris.
- C. Clean excess soil may be distributed on site as accepted by Inspector, if it does not adversely affect specified finish grades. Coordinate with Drawings and Subgrade Preparation and Base Material.

3.8 CLEANING, per Section 31 10 00.

- A. Upon completion of earthwork operation, clean areas within contract limits, remove tools and equipment. Provide a clear, clean site, free of debris and suitable for site work operations.

END OF SECTION

02/04/19

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Excavating, backfilling and compacting for utilities.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 GOVERNING DOCUMENTS

- A. The 2016 California Building Code (CBC) Title 24 Part 2, Chapter 33 - Site Work, Demolition and Construction, except as modified herein.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Select Bedding Sand: Class A screened fill sand with a maximum particle size of 1/2 inch, not exceeding 18 percent and free of expansive materials, debris and organic matter.
- B. Select Backfill Material: Non-expansive soil excavated from the utility trench or site cut areas, or from off-site, borrowed fill material, which in the opinion of the Geotechnical Engineer is suitable for backfilling. Provide material which contains no rocks or clods over 3 inches in diameter, is free of debris and organic matter, and a minimum of 40 percent of the material passes a No. 4 screen. Limit rock and clod size to 3 inches maximum diameter for backfilling trenches 12 inches or less in width.

PART 3 – EXECUTION

3.1 GENERAL

- A. Layout: Carefully layout the route of each underground utility before trenching. Drawings and coordinate with underground construction by other trades to avoid conflicts.
- B. Clearances: Take special notice and maintain the required horizontal and vertical depth clearances from structural footings for utility trenches running parallel to footings. Do not violate the area of the footing bearing prism. In the event of conflict (i.e., the utility cannot be relocated or its depth changed), proceed as directed by the Architect.

3.2 TRENCHING

- A. Grades and elevations indicated and as specified. Hand trim changes in direction and bottoms of trenches. Provide shoring in trenches over 5 feet deep and also in trenches where unstable soil conditions are encountered. Comply with OSHA requirements.

- B. Pipe Trench Dimensions: The following requirements are considered minimal unless otherwise indicated, in order to provide adequate pipe clearances and bedding. Provide trenches wider than the specified minimums where required to properly install the particular type of piping. In the event utility company regulations, code requirements, or the pipe manufacturer's recommendations differ from these provisions, the most restrictive requirements shall take precedence:

Pipe Burial Depths (minimum):	
Sewer & Drainage:	24" + pipe O.D. + 3" bed
Gas:	30" + pipe O.D. + 4" bed
Water (Domestic)	
PVC:	30" + pipe O.D. + 4" bed
All other:	24" (30" at planters) + pipe O.D. + 4" bed
Water (Irrigation Pressure Piping)	
3" diameter or less:	18" + pipe O.D. + 2" bed
4" diameter or more:	Same as domestic water

Notes: Finish grade to top of pipe, typical. O.D.: Outside dimension.

Trench Widths:

Sewer & Drainage:	12" + pipe O. D. for 4" to 18" diameter pipe
Gas:	8" + pipe O.D.
Water (Domestic):	8" + pipe O.D.
Water (Irrigation Pressure Piping):	
3" diameter or less:	4" + pipe O.D.
4" diameter or more:	8" + pipe O.D.

- C. Common Trench Requirements:

1. Do not install copper piping or metal gas piping in a common trench with other dissimilar metal piping or conduit; separate a minimum of 4 feet when running parallel to such piping or conduit.
2. Separate multiple parallel lines of piping in a common trench a minimum of 12 inches, both horizontally and vertically, between individual pipes.
3. Install domestic water piping, running parallel in a common trench with sewer or drainage lines, on a solid shelf 12 inches above the sewer or drainage piping.
4. Do not run electrical power and communications conduit in a common trench with sewer, drainage, water or gas piping.

- D. Additional provisions for underground piping within building areas: Specification sections under Division 22 and details as indicated.

- E. Requirements for underground electrical and communications conduit, ducts: applicable specification sections under Division 26 and Division 27 and details as indicated.

3.3 BEDDING AND BACKFILLING

- A. Bedding: Lay and bed pipe in compacted select bedding sand, thickness as specified herein and backfill with the same material to a height of one foot above the top of pipe. Place in 6 inch layers and compact to a minimum relative density of 90 percent. Compact the soil in a manner that will not displace or damage the pipe.

1. Sewer and drain lines may be bedded in the native soil provided it is rock free and sandy. Dig out under bell portions of the piping for uniform bearing.

2. Irrigation Piping - Not applicable.
 3. Conduits, ducts, laid in a single layer, running parallel and in the same horizontal plane and not concrete encased, shall be "bedded" as specified herein. The select sand bedding for multilayered banks of conduit not concrete encased, shall be water settled (not flooded) to completely fill the voids between the conduits with sand.
 4. Provide warning tape in all gas and electrical trenches.
- B. Backfilling: Backfill the remaining trench depth, including concrete encased utilities, with select backfill material at optimum moisture content, place in 6 to 8 inch layers and compact to a minimum relative density of 90 percent. Attain compaction by any method (other than water jetting) that will obtain the minimum specified relative densities, without damaging the buried lines.
- C. Install underground utility materials requiring special bedding and backfilling methods as recommended in conjunction with these materials or as indicated.

3.4 QUALITY CONTROL

- A. Do not backfill underground utility lines until:
- 1 The "As-Built" elevations and dimensions are recorded on "Record Drawings" and verified
 2. The utility lines have been inspected and satisfactorily tested.
- B. Backfill compaction tests will be performed by the Owner's Geotechnical Engineer, in accordance with Section 01 45 00 "Quality Control", at locations and depths as directed. If the required minimum relative compaction density has not been obtained, excavate and re-backfill the deficient portion of the trench.

3.5 CLEANUP

- A. Pick up and transport unsuitable and deleterious material to an off-site legal disposal area. Place acceptable excess earth in on-site areas as compacted fill.

END OF SECTION

08/27/18

SECTION 31 63 29

DRILLED CONCRETE PIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dry-installed or slurry displacement-installed drilled piers at Contractor's choice, as dictated by site conditions.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Document 00 31 32 "Geotechnical Data".
2. Section 03 11 00 "Concrete Reinforcing" for steel reinforcing for drilled concrete piers.
3. Section 03 30 00 "Cast-in-Place Concrete" for cast-in-place concrete for drilled concrete piers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to drilled piers including, but not limited to, the following:
 - a. Review geotechnical report and drilled pier recommendations.
 - b. Discuss existing utilities and subsurface conditions.
 - c. Review coordination with temporary controls and protections.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: As specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Shop Drawings: For concrete reinforcement, detailing fabricating, bending, supporting, and placing.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Record drawings.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.

1.7 FIELD CONDITIONS

- A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
 - 1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
- B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Owner's written permission.
- C. Project-Site Information: A geotechnical report have been prepared for this Project and are available for information only. The opinions expressed in these reports are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
 - 2. The geotechnical report is referenced elsewhere in the Project Manual.
- D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 - 1. Record and maintain information pertinent to each drilled pier and indicate on record Drawings. Cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Drilled-Pier Standard: Comply with ACI 336.1 except as modified in this Section.

2.2 STEEL REINFORCEMENT

- A. Steel Reinforcement: As specified in Section 03 11 00 "Concrete Reinforcing".

2.3 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Section 03 30 00 "Cast-in-Place Concrete".

2.4 SLURRY

- A. Slurry: Polymers mixed with water to form stable colloidal suspension; complying with ACI 336.1 for density, viscosity, sand content, and pH.

2.5 CONCRETE MIXTURES

- A. Concrete Mixtures: As specified in Section 03 30 00 "Cast-in-Place Concrete".

2.6 REINFORCEMENT FABRICATION

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice".

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: As specified in Section 03 30 00 "Cast-in-Place Concrete".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

- A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
 - 1. Obstructions: Unclassified excavated materials may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. Payment for removing obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work is according to Contract provisions for changes in the Work.
- B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

- C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
 - 1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
 - 2. Remove water from excavated shafts before concreting.
- D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
 - 1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
 - 2. Payment for additional authorized excavation is according to Contract provisions for changes in the Work.
- E. Slurry Displacement Method: Stabilize excavation with slurry maintained a minimum of 60 inches above ground-water level and above unstable soil strata to prevent caving or sloughing of shaft. Maintain slurry properties before concreting.
 - 1. Excavate and complete concreting of drilled pier on same day, or redrill, clean, and test slurry in excavation before concreting.
- F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 - 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete, or leave temporary casings in place.
- G. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
 - 1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit corrective construction proposals to Architect for review before proceeding.

3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
- C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.
- D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.
- E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.
- F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

- A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by a qualified Special Inspector or testing agency.
- B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
 - 1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
 - 2. Vibrate top 60 inches of concrete.
- C. Slurry Displacement Method: Place concrete in slurry-filled shafts by tremie methods or pumping. Control placement operations to ensure that tremie or pump pipe is embedded no less than 60 inches into concrete and that flow of concrete is continuous from bottom to top of drilled pier.
- D. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
 - 1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.
- E. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.
- F. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.
- G. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 30 to maintain delivered temperature of concrete at no more than 90 deg F.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Drilled piers.
 - 2. Excavation.
 - 3. Concrete.
 - 4. Steel reinforcement welding.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
 - 1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities are determined by testing and inspecting agency. Final evaluations and approval of data are determined by Geotechnical Engineer.

- a. Bearing Stratum Tests: Testing agency takes undisturbed core samples from drilled-pier bottoms; tests each sample for compression, moisture content, and density; and reports results and evaluations.
- D. Concrete Tests and Inspections: As specified in Section 03 30 00 "Cast-in-Place Concrete".
- E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.
- F. Testing Agency to prepare test and inspection reports for each drilled pier as follows:
 - 1. Actual top and bottom elevations.
 - 2. Actual drilled-pier diameter at top and bottom.
 - 3. Top of rock elevation.
 - 4. Description of soil materials.
 - 5. Description, location, and dimensions of obstructions.
 - 6. Final top centerline location and deviations from requirements.
 - 7. Variation of shaft from plumb.
 - 8. Shaft excavating method.
 - 9. Depth of rock socket.
 - 10. Properties of slurry and slurry test results at time of slurry placement and at time of concrete placement.
 - 11. Ground-water conditions and water-infiltration rate, depth, and pumping.
 - 12. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary or permanent casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
 - 13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
 - 14. Date and time of starting and completing excavation.
 - 15. Inspection report.
 - 16. Condition of reinforcing steel and splices.
 - 17. Position of reinforcing steel.
 - 18. Concrete placing method, including elevation of consolidation and delays.
 - 19. Elevation of concrete during removal of casings.
 - 20. Locations of construction joints.
 - 21. Concrete volume.
 - 22. Concrete testing results.
 - 23. Remarks, unusual conditions encountered, and deviations from requirements.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

04/01/19

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the contract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes:
 - 1. Aggregate base.
 - 2. Subgrade Preparation.
- C. Related Sections:
 - 1. Division 01 "General Requirements."
 - 2. Division 32 Section "Asphalt Paving and Surfacing".

1.2 REFERENCES

- A. General:
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - 3. Refer to Division 01 "General Requirements" for the list of applicable regulatory requirements.
- B. State of California - California Department of Transportation (CALTRANS):
 - 1. Standard Specifications: Section 26 Aggregate Bases.

1.3 DEFINITIONS

- A. Acceptance: Wherever the terms acceptance or accepted are used herein, they mean acceptance of the Architect-Engineer in writing.
- B. Subgrade: The soil surface on which aggregate base or cement-treated base is placed.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01 "General Requirements."
- B. Test Results:
 - 1. Compaction Tests.

1.5 QUALITY ASSURANCE

- A. Single Source: Furnished from single source throughout Work.

- B. Certification: Arrange with District to have District's Geotechnical Engineer certify that source of materials for this Work meets these Specifications and provide tests required to prove that Work-in-progress meets requirements of these Specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. On Site Storage: Store aggregate-base material on-site covered or in a location where material will not be contaminated.

1.7 SITE CONDITIONS

- A. Unfavorable Weather: When weather is such that satisfactory results cannot be secured, suspend operations until the weather is considered favorable.
- B. Wet Subgrades: Do not place material on wet or muddy subgrade.

1.8 WARRANTY

- A. General Description: In addition to manufacturer's warranties, warrant Work for a period of one year from the Date of Final Completion against defects in materials and workmanship.
- B. Additional Items Covered: Warranty shall also cover repair of damage to other materials and workmanship resulting from defects in materials and workmanship.
- C. Exceptions: Subcontractor shall not be held responsible for failures due to ordinary wear, neglect by the District, vandalism, or other causes beyond the Subcontractor's control.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Aggregate Base: SS Section 26-1.02A, Class 2, meeting requirements of 3/4-inch (20 mm) maximum size from a single source.
- B. Water: Fresh, clean, potable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of General Conditions: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Subgrade: Review to verify that it has been inspected, graded to the correct grades, and compacted as required for correct installation of aggregate base.
- C. Notification of Unsuitable Conditions: Before proceeding with Work, notify the Project Manager in writing of unsuitable conditions and conflicts.

3.2 PREPARATION

- A. Protection of Existing Conditions:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, plant materials and walks on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
 - 3. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
 - 4. Submit written notification of damaged plants and structures to the Project Manager.
- B. Subgrade Preparation:
 - 1. Meet requirements of Project Geotechnical Report recommendations for subgrade preparation prior to placement of aggregate base or cement-treated base.
 - 2. Grade subgrade with uniform slope between points where elevations are given.
 - 3. Use equipment of proper size and appropriate type to achieve grades required.
 - 4. Grade subgrade surface to within 0.05-foot (15 mm) of elevations indicated by the Drawing details.
 - 5. Fill and compact any depressions and remove loose material to finish true to line and grade, presenting a smooth, compacted and unyielding surface, except where indicated otherwise.
 - 6. Remove debris, loose dirt and other extraneous materials.

3.3 AGGREGATE BASE

- A. Pre-wetting Aggregate Base: Meet requirements of CALTRANS Specifications Section 26.
- B. Hauling:
 - 1. Use of dragline equipment to transport aggregate from stockpiles to elevators or other loading devices will not be permitted.
 - 2. Distribute hauling over the area to be paved in such a manner as to be most effective in the compacting of the surfacing.
 - 3. Hauling over any of the surfacing in process of construction will not be permitted when, in the opinion of the District, the effect will be detrimental.
 - 4. Uniformly load hauling vehicles when it is practicable.
- C. Placement of Aggregate Base:
 - 1. Spread base in an even distribution of material without perceptible segregation.
 - 2. Method of spreading and field operation shall be acceptable to the District at all times and in accordance with of CALTRANS Specifications Section 26.
 - 3. Construct base course in lifts not exceeding 6 inches (150 mm) in depth so that when compacted to the specified density, the finished surface will conform to grades and dimensions shown, with proper allowance for subsequent courses where specified.
 - 4. Construct the base course in an orderly manner so that reasonable size areas will be ready for testing and a reasonable length of time will be allowed for the District to perform tests and obtain the test results during normal working hours.
 - 5. Equipment such as scrapers, and other equipment essentially used for earth excavation, will not be permitted.
 - 6. Compaction equipment shall be adequate in design and number to obtain the specified density for each layer while still moist.
 - 7. Apply water as needed to obtain the specific densities.
 - 8. Place each layer of base course and compact to the specified density before a succeeding layer is placed.
- D. Compacting of Aggregate Base:

1. Compact each lift of base as soon after spreading operations as practicable and continue until a density of 95 percent of the maximum density has been achieved as determined in accordance with ASTM D1557.
 2. Roll each course of surfacing until the material does not creep under the roller before a succeeding course of surfacing material is applied.
 3. At the outer edges of the surfacing and continue toward the center.
 4. Correction of Surface Defects: Should irregularities develop in any surface during or after rolling, they shall be remedied by loosening the surface and correcting the defects, after which the entire area, including surrounding surfaces, shall be rerolled until thoroughly compacted. Finished surfaces shall be true to grade and crown before proceeding with surfacing.
- E. Patrolling: Surfacing in progress of construction shall be bladed and otherwise worked as may be necessary to maintain proper grade and cross section at all times and to keep the surface smooth and thoroughly compacted.
- F. Final Clean-up:
1. After work is completed, the entire area shall be neatly finished and trimmed to lines, grades and cross sections shown.
 2. Unused construction material shall be removed, and stockpile areas shall be cleaned of aggregate and left in an acceptable condition.

3.4 TOLERANCES

- A. Subgrade Surface: Plus or minus 0.05-foot or elevations indicated by the Drawing details.
- B. Aggregate Base Course Variation from Thickness: Plus or minus 0.05-foot.
- C. Aggregate Base Course Finished Surface Smoothness: Plus or minus 1/4-inch.

END OF SECTION

08/27/18

SECTION 32 12 16

ASPHALT PAVING AND SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site asphalt concrete paving and surfacing. Any work within the Public right-of-way shall be done to the standards of the local City or County or the State of California Department of Transportation. Paving and surfacing includes but is not limited to.
 - 1. Asphalt Concrete Paving.
 - 2. Liquid Asphalt and Asphalt Emulsion.
 - 3. Aggregate Base.
- B. Related work furnished under other sections but conforming to the provisions of this section:
 - 1. Section 31 20 00 - Earthwork: Subgrade preparation.
 - 2. Section 32 11 23 - Aggregate Base Courses: Aggregate Base installation.
 - 3. Section 32 13 13 - Landscape Site Concrete.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM International):
 - 1. ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)
 - 2. ASTM D5035 - 11(2015) - Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).
- B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site development Requirements for Handicapped Accessibility.
- C. California Department of Transportation (C.D.T.):
 - 1. Standard Specifications:
 - a. Section 26 Aggregate Bases.
 - b. Section 37 Bituminous Seals.
 - c. Section 39 Asphalt Concrete.
 - d. Section 92 Asphalts.
 - e. Section 93 Liquid Asphalts.
 - f. Section 94 Asphaltic Emulsions.
 - 2. Traffic Manual.

3. Highway Design.

D. Institute of Transportation Engineers: Transportation and Traffic Engineering Handbook.

1.3 SUBMITTALS

A. Requirements: Refer to Section 01 33 00 – SUBMITTALS.

B. Asphalt Concrete Paving:

1. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.
2. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement.

C. Product Data:

1. Liquid Asphalt.
2. Pavement Reinforcement Fabric.
3. Tack Coat.
4. Aggregate base.
5. Paint.

1.4 PROJECT CONDITIONS

A. Liquid Asphalt and Asphalt Emulsion:

1. Prime coat, seal coat, and paint binder shall be applied only when the ambient temperature is above 50° Fahrenheit and when temperature has not been below 35° Fahrenheit for 12 hours immediately prior to application.
2. Prime coat, fog coat, seal coat, and paint binder shall not be applied when base or surfaces are wet or contain excess moisture.

B. Asphalt Concrete Paving:

1. Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50° Fahrenheit and when base is dry.

1.5 GENERAL DESIGN CRITERIA:

- A. Services Areas: Approach ramps, driveways, and paved work areas in excess of 4 percent slope shall be provided with a rough texture for non-skid surface.
- B. Pavement Markings: All traffic control striping and pavement markings shall conform to the standards illustrated in the C.D.T. Standard Plans Book current edition.

PART 2 - PRODUCTS

2.1 PAVING MATERIALS

A. Aggregate Base:

1. Aggregate base shall conform to Caltrans Class 2 (R value 78 min) aggregate base, 3/4" maximum size, as specified in Section 26 of the C.D.T. Standard Specifications.

B. Asphalt Concrete Paving:

1. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, AR-4000, conforming to Section 92 of the C.D.T. Standard Specifications.
2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the C.D.T. Standard Specifications.
3. Maximum aggregate size shall be as follows:
 - a. Pathways: 1/2" Fine
 - b. Drive Aisle: 3/4" Medium
4. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the C.D.T. Standard Specifications.

C. Pavement Reinforcement Fabric:

1. Pavement reinforcement fabric shall meet Caltrans Section 88-1.02, BP Petromat or approved equivalent.

D. Crack Sealant:

1. Crack sealant: Rubberized hot-pour type and shall meet ASTM D 3405, Husky 1611 or approved equivalent.
2. Blotting Agent: One of: Screened sand, cement, or fly ash.

E. Tack coat: Meet Caltrans Section 39-4.02.

PART 3 - EXECUTION

3.1 PREPARATION

A. Subgrade and Aggregate Base:

1. Prepare a subgrade and over-excavation per Section 31 20 00 - EARTHWORK.
2. Aggregate base shall be compacted to 95 percent ASTM D1557. Sections 26-1.04B and 26-1.05 of the C.D.T. Standard Specifications shall apply.
3. Apply soil sterilant to prepared subgrade in areas indicated by soils engineer or after installation of rock or aggregate base uniformly at the rate recommended by the manufacturer.

B. Crack Sealing:

1. Before sealing, clear cracks of dirt, dust, and all other deleterious materials to a depth of 1/4-inch to 1/2-inch.

2. Seal cracks 1/8-inch in width and greater. .
3. Apply crack sealer accordance with the manufacturer's recommendations unless otherwise directed.

3.2 ASPHALT CONCRETE PAVING

A. General:

1. Proportion, mix, place, spread, and compact asphalt concrete in conformance with Section 39 of the C.D.T. Standard Specifications.
2. Before placing asphalt concrete, apply an asphalt emulsion tack coat to all vertical surfaces of existing pavement, curbs, gutters, construction joints, and all existing pavement to be surfaced, in conformance with Section 39 of the C.D.T. Standard Specifications.
3. Perform spreading and compacting of asphalt concrete in accordance with Section 39 of the C.D.T. Standard Specifications.
4. Apply fog seal to all finished surfaces of asphalt concrete pavement at a rate of 0.05 gallons per square yard, in accordance with Section 37 of the C.D.T. Standard Specifications.
5. After fog seal has been applied, allow ample time for drying before traffic is allowed on the pavement or paint striping is applied.

3.3 FIELD QUALITY CONTROL

- A. Asphalt Base: The surface of finished aggregate base shall vary no more than 0.05 feet above or below the grade established as shown on the drawings.

B. Asphalt Concrete Paving:

1. The finished pavement, where not controlled by adjacent structures or features, shall not vary more than 0.05 feet above or below the planned grade, providing it is uniform and free of sharp breaks.
2. The cross section of the finished pavement shall be free of ridges and valleys and shall not vary more than 0.02 feet above or below the theoretical section at any point on the cross section.
3. The specified thickness of the finished pavement shall be the minimum acceptable. Conforms shall form a smooth, pond free transition between exiting and new pavement.
4. Depressions in paving between high points are not to exceed 1/8 inch when measured below 10 feet long straight edged placed anywhere on the surface in any direction.

3.4 CLEANUP

A. General:

1. Surplus material remaining upon completion of paving operations shall become the property of the Contractor, to be removed from the work site and disposed of in a lawful manner.
2. Leave surfaces in a clean, neat, and workmanlike condition, and remove all construction waste, rubbish, and debris from the work site and dispose of in a lawful manner.

END OF SECTION

08/27/18

SECTION 32 13 13

LANDSCAPE SITE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide Portland cement concrete site work complete, including the following principal items:
 - 1. Retaining walls and stairs.
 - 2. Curbs, walks and pavements, including aggregate bases.
 - 3. Footings for posts and structures.

1.2 COORDINATION

- A. Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in the concrete and for the provision of holes, openings, etc., necessary to the execution of the work of the trades.

1.3 SUBMITTALS, per Section 01 33 00

- A. Samples of all materials under this Division shall be supplied for testing as requested by the Owner.
- B. Submit color additive manufacturer's color chart and sample chip(s), indicate color additive number and required dosage rate.
- C. Submit two full-scale mock-up (minimum 3' by 3') sample panels of all concrete finishes and color (with curing compound if any to be used and score joints) indicated on the drawings. Approved samples shall be kept at the job site to serve as a prerequisite for all finishes until acceptance of the Work.
- D. Submit one pint samples of aggregate for exposed aggregate finished concrete paving in color range as specified.

1.4 QUALITY ASSURANCE

- A. Reference and Standards:
 - 1. Perform work in accordance with all applicable laws, codes and regulations.
 - 2. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.
 - 3. The American Concrete Institute (ACI): "Manual of Concrete Practice," Parts 1, 2 and 3.
 - 4. "Recommended Practice for Concrete Formwork" (ACI 347R)
 - 5. United States Voluntary Product Standard for Construction & Industrial Plywood (PS 1-95).
 - 6. American Plywood Association's "Guide to Plywood Grades" (APA).
 - 7. West Coast Lumber Inspection Bureau's "Standard Grading Rules No. 16" (WCLIB)
 - 8. Concrete Reinforcing Steel Institute (CRSI): "Manual of Standard Practice" and "Recommended Practice for Placing Reinforcing Bars".
 - 9. American Welding Society: AWS A5.1 and AWS D1.4.
 - 10. Americans with Disabilities Act (ADA), Federal ADA/State of California Title 24 Standards.

11. California Code of Regulations, Title 24, 2016 Edition, also known as California Building Code (CBC).

B. Stipulations:

1. Finish Surface Tolerance: 1/4-inch maximum variation in 10 feet.
2. At no point shall paving surface fail to drain.
3. Finish Concrete Surface Slip Resistance: Shall have a minimum slip resistance coefficient of 0.65 on concrete pavement with less than 5% slope and 0.8 on concrete pavement with more than 5% slope.
4. Walls retaining soil that retain 30 inches or more of soil shall include a subsurface drain behind wall per Section 68 of the Standard Specifications and as accepted by the Owner's Representative.

C. Testing and Inspection, per Section 01 45 00.

D. Conform to ACI 305 during hot weather and to ACI 306 during cold weather.

E. Requirements of ACI 301 shall govern work, materials and equipment related to this Section; specifications herein set minimum results required, and references to procedures are intended to establish minimal guides.

F. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements

G. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that:

1. Specified concrete strengths will be met.
2. Equipment has a record of satisfactory performance under similar conditions and using a similar mix.
3. Trial batches have been successfully made.

H. Installer Qualifications: Concrete work shall be by firm with 5 years experience with work of similar scope and quality.

I. Formwork Design Criteria: Formwork shall conform to ACI 347 and CBC Section 1906A.

1. Formwork:
 - a. Shall prevent leakage or washing out of cement mortar.
 - b. Shall resist spread, shifting, and settling.
 - c. Shall reproduce accurately required lines, grades and surfaces within tolerances specified.
2. Safety: The Contractor shall be responsible for adequate strength and safety of all formwork including falsework and shoring.
3. Formwork allowable tolerances: Formwork shall produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.

1.5 TESTS

A. The Owner will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary. Costs for such tests will be paid by the Owner. Contractor shall cooperate in making tests and shall be responsible for notifying the designated laboratory in sufficient time to allow taking of samples at time of pour.

B. Should tests show that concrete is below specified strength, Contractor shall remove all such concrete, as directed by the Owner. Full cost of removal of low strength concrete, its replacement with concrete of proper specified strength and testing, shall be borne by Contractor.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Supply ready mixed concrete throughout. Batch, mix and transport in accordance with ASTM C-94, "Specifications for Ready Mixed Concrete."
- B. Mix and deliver concrete in quantities that will permit immediate use only.
- C. Indiscriminate addition of water for any reason will be cause for rejection of the load.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged throughout work.
- B. Mixes:
 - 1. Ready-mixed concrete shall meet requirements of ASTM C94.
 - 2. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.
 - 3. For each mix, submit data showing that proposed mix will attain the required strength in accordance with requirements of ACI 318, Sec. 26.4.2.
 - 4. Instruct Laboratory to base mix design on use of materials specified and approved by the Owner's Representative.
 - 5. Mix design shall include compression strength test reports per ACI 318, Sect. 26.4.3.1.
 - 6. Insure mix designs will produce concrete to strengths specified and of uniform density without segregation.
 - 7. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard, without changing cement content.
 - 8. Introduction of calcium chloride will not be permitted.
 - 9. Mix design shall be in accordance with ACI 318, Sec. 26.4.2.

2.2 FORMWORK MATERIALS

- A. Panel or board forms for Exposed Finish Concrete: Minimum 5/8-inch thick exterior grade plywood with sealed edges, PS 1 grade Plyform Class I and II B-B Exterior.
- B. For Exposed Smooth Form-finished Concrete: Use Medium Density (or better) Overlaid Concrete Form Exterior (MDO), to provide continuous straight, smooth, exposed surfaces without grain patterns. Furnish in largest practicable sizes to minimize number of joints and to conform to a joint system as approved by Owner's Representative.
- C. Curbs may be formed with approved metal form systems.
- D. Chamfer Strips: Burke Concrete Accessories, PVC type CSF 1/2-inch or as otherwise shown, all exposed corners.
- E. Form Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex"; or equal.
- F. Form Ties: Burke "Penta-Tie," or equal, cone and rod type with 1-inch break-back.

2.3 REINFORCING MATERIALS

- A. Bar Reinforcement: ASTM A615.

1. #3 and smaller: Grade 40.
 2. #4 and larger: Grade 60.
- B. Wire Fabric Reinforcement: ASTM A185. Size (6" by 6" / W1.4 By W1.4 (#10 ga. by #10 ga.)
- C. Recycled content shall be a minimum of 75% recycled post consumer steel.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type II. Use one brand of cement throughout project.
- B. Fly Ash: ASTM C618, Type F.
- C. Aggregates: ASTM C33, materials from established sources with proven history of successful use in producing concrete with minimum shrinkage.
- D. Water: Clear and potable, free from deleterious impurities.
- E. Admixtures:
1. Admixtures are optional; however, a water reducer or plasticizing admixture shall be included in the concrete mix and it must be compatible with color pigments where color pigments are required. Any proposed admixture shall comply with State Section 2603(b) 5 of Part 2, Title 24 CCR.
 2. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.
 3. Accelerating admixtures and admixtures containing more than 0.05 percent chloride ions are not permitted. If an accelerator is used, it shall be a non-chloride accelerator.
 4. Liquid admixtures shall be considered part of the total water.
- F. Color Additives/Pigments: Insoluble minerals, light fast, at least 95 percent passing #325 sieve complying with ASTM C979: L.M. Scofield Co., Los Angeles, CA (800) 800-9900; Davis Colors, Los Angeles, CA (800) 356-4848; or equal. Color(s) shall be as follows:
1. Color A: L.M. Scofield, CHROMIX P® Admixtures for Color-Conditioned Concrete; "Mesa Beige" C-12.
 2. Color B: L.M. Scofield, CHROMIX P® Admixtures for Color-Conditioned Concrete; "French Grey" C-14.
 3. Typical dosages range between 0.2 to 10.0 pounds material per 94 pound sack of cement.
 4. Color additives containing carbon black are not acceptable.

2.5 CONCRETE MIXES

- A. Concrete mixes shall be approved and shall be in accordance with Caltrans Standard Specifications Section 90. Unless otherwise noted, mix shall be Class "A," 3,000 psi, Type II Portland cement and 3/4-inch maximum aggregate.
- B. Cementitious Material: An intimate blend of Portland cement and fly ash. Cementitious material shall include 15% minimum to a maximum of 25% fly ash by weight unless the strength is specified to be achieved on 7 or 14 days.
- C. Lampblack: As supplied by batch plant for plain non-colored concrete work. Concrete for non-colored pavements shall be darkened by the addition of lampblack at the mixer. The proportion of lampblack or other approved colorant shall be that required to properly darken the concrete to reduce glare, and shall be subject to the approval of the Owner's Representative. Provide 3/4 pound of lampblack per cubic yard of concrete unless required otherwise.

2.6 ANCILLARY MATERIALS

- A. Aggregate Base: Class II aggregate base conforming to Section 26 of the Standard Specifications and Subgrade Specifications herein.
- B. Preformed Expansion Joint Filler:
 - 1. Description: ASTM D8139, asphalt-free, semi-rigid, closed-cell polypropylene foam.
 - 2. Source: Nomaflex by Nomaco, Inc.
 - 3. Thickness: 1/2-inch.
- C. Dampproofing: Per CALTRANS Standard Specifications, Section 54.
- D. Subsurface Drain behind Retaining-Type Walls: All concrete walls that retain 30 inches of soil or more shall include a subsurface drainage system to relieve water pressure in accordance with Section 68 of the CALTRANS Standard Specifications and as shown. If no subsurface drain is shown, provide corrugated polyethylene plastic tubing per 68-1.02K surrounded with an envelope of Class 2 permeable material per 68-1.025 and wrapped with filter fabric per 68-1.028.
- E. Curing Materials for non-colored Concrete:
 - 1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Sisalkraft Division of St. Regis Paper Co.'s "Orange Label", or equivalent.
 - 2. Impervious sheeting: 4 mil white polyethylene laminated to 10 oz. Burlap, ASTM C171, Type 1.1.3, fungus-resistant.
 - 3. Curing Compound: ASTM C309. Type 1-D, Class B; dissipating resin. Product: Sealtight 1100 Clear-Series by WR Meadows, Burke Azua Resin Cure by Edocol, or equal that will not discolor concrete or affect bonding of other finishes applied thereafter, and which restricts loss of water to not more than 0.500 grams per sq. centimeter of surface when tested per ASTM C156, "Test Method for Water Retention by Concrete Curing Materials."
- F. Curing Compound for Colored Concrete: Water-base acrylic type, free of permanent color, oil or wax, complying with ASTM C309: "W 1000" by Davis Colors, Los Angeles, CA (800) 356-4848; "Cureseal" semi-gloss by L.M. Scofield Co., Los Angeles, CA (800) 800-9900; or equal.
- G. Grout: Premixed high strength non-shrink grout requiring only addition of water at the site. Burke's "Non-Ferrous, Non-Shrink Grout"; Master Builders "Masterflow 928 Grout", or equal.
- H. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand. Provide integrally colored patching mortar as required to match color and finish of colored concrete surfaces.
- I. Abrasive Grains: Fused aluminum oxide granules or crushed emery containing not less than 50% aluminum oxide. Factory graded, rustproof, nonglazing and unaffected by cleaning materials. Subject to compliance with requirements provide one of the following: Sonneborn-Contech's "Frictex NS"; General Abrasive Co., Inc.'s "Fut-Sure"; The Exolon Co.'s "Exolon Anti-Slip"; or equal.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Install all concrete work true to line and grade as indicated on the drawings.

- B. Correct irregularities to the satisfaction of the Owner's Representative.
- C. Plain non-colored, exposed concrete shall contain lampblack, approximately 3/4 pound of lampblack per cubic yard, as accepted by Owner's Representative.

3.2 PREPARATION

- A. Provide subgrade preparation and the base material installation complete, including clearing, grading, excavation, and filling and dewatering. Take every precaution to obtain a subgrade of uniform bearing power compacted to a minimum of 90% relative compaction as determined by the ASTM D1557 laboratory test procedure and in Sections 19 and 20 of the Caltrans Standard Specifications.
- B. Subgrade shall be kept moist and shall not be allowed to dry out before placement of concrete. Place no material on muddy subgrade.
- C. Aggregate base, where indicated, shall be placed and compacted in conformance with Caltrans Standard Specifications 26-1.04 and 26-1.05.
- D. Obtain approval of subgrade from Owner's Representative prior to placing steel and concrete.

3.3 FORMS

- A. Forms shall be constructed in accordance with ACI 347 and shall be of sufficient strength and sufficiently tight to prevent visible distortion or leakage of mortar and fines.
- B. Forms for exposed surfaces shall be constructed to protect intended finish. Deflection of facing material between studs shall not exceed 0.0025 of the span. Facing material and pattern of joints shall be as approved by the Owner's Representative.
- C. For vertical surface of wall footings below grade, clean cut trench may be used in lieu of form if character of soil will permit installation without sluffing and width of concrete is increased at least 1 inch beyond indicated dimension of each face poured against earth.
- D. Curb and pavement edge forms shall extend full depth of concrete and shall be coordinated with installation of planting root barriers where required. Curves shall be formed with flexible metal or wood made up of thin laminations. Curve forms shall extend one stake space straight beyond tangent point. Where curbs and pavement are adjacent to areas to receive root barriers, provide smooth uniform edges. Remove any excess concrete as required to allow installation of root barriers without gaps between curbs and/or pavement and barriers.
- E. Maintain forms within the following tolerances:
 - 1. Top of Form: Plus or minus 1/8 inch in 10 feet and no abrupt variations; at required elevation to plus 3/8 inch.
 - 2. Face of Form: Plus or minus 1/4 inch in 10 feet longitudinal and no abrupt variations; perpendicular to surface plus or minus 1/8 inch.
- F. Form Ties: Align form ties as accepted by Owner's Representative. Obtain approval of form work from Owner's Representative prior to placing concrete.
- G. Forms may be reused upon cleaning and coating with parting compound to ensure separation from concrete without damage.
- H. After concrete is placed, the following minimum times shall elapse before removal of forms.
 - 1. Walls and benches: 48 hours.
 - 2. Footing sides: 24 hours.
 - 3. Curbs: 1 hour

3.4 REINFORCEMENT

- A. All concrete shall be steel reinforced unless specifically noted to be "not reinforced." If no reinforcement is shown, reinforce in same manner as that shown in similar places.
- B. Fabricate and place reinforcement as indicated on the Drawings and in accordance with ACI "Detailing Manual" SP-66. No reinforcement shall be placed prior to distribution of the approved shop drawings.
- C. Secure reinforcement in position by suitable supports and by wiring at intersections with tie wire. Supports shall be of sufficient number and strength to resist crushing or displacement under full load. Metal shall not extend to surface of concrete.
- D. At time of placing concrete, reinforcing shall be free of excessive rust, mill scale, or other bond reducing matter. Immediately before placing concrete, check and adjust position, support and anchorage.

3.5 CLEANING, PATCHING AND DEFECTIVE WORK

- A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and, in the Owner's Representative's judgment, these defects impair proper strength or appearance of the work, the Owner's Representative will require its removal and replacement at the Contractor's expense.
- B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar colored and textured to match concrete. Remove ledges and bulges.
- C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.
- D. Rock Pockets:
 - 1. Cut out to full solid surface and form key.
 - 2. Thoroughly wet before casting mortar.
 - 3. Where the Owner's Representative deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, and replace.
- E. Cleaning:
 - 1. Insure removal of bituminous materials, form release agents, bond breakers, curing compounds, if permitted and other materials employed in work of concreting that would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.
 - 2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

3.6 MIXING AND PLACING CONCRETE

- A. Conform to applicable requirements set forth in Caltrans Standard Specifications Section 90.
- B. Mixes for integrally colored concrete shall have pigment added early enough to ensure complete dispersal and uniform color, but not less than 15 minutes before placing.

3.7 JOINTS AND GROOVES

- A. Plane of joints shall be perpendicular to surface. Where new pavements join existing, joints shall align.
- B. Sawn Contraction Joints:
 - 1. General: Provide where shown. Saw cut straight, true, and uniform, 1/8 inch-wide and not less than 1/4 of slab thickness in depth, unless otherwise noted. Cut with a power saw fitted with an abrasive or diamond blade.
 - 2. Commence saw cutting operations after concrete has cured long enough to resist damage by the saw cutting operations and early enough to avoid random contraction cracks.
 - 3. Contractor shall coordinate form removal and sequencing of adjacent concrete placement to minimize unnecessary saw cutting of adjacent surfaces.
 - 4. Contractor shall plan for the use of varying types of saw cutting apparatus to provide acceptable finishes in areas limited in accessibility.
 - 5. Fill saw cut over-runs and inadvertent saw cutting of adjacent surfaces with cement mortar to match color and finish of sawn pavement.
 - 6. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to column centerlines, wall corners, etc. as accepted by Owner's Representative.
- C. Expansion Joints and Edging: Provided at the location and intervals as shown on the drawings, and at all locations where concrete paving abuts buildings, curbs or other structures, and not more than 18 feet on center. Specified and shown joint material shall be placed with top edge 1/8" below the paved surface, and shall be securely held in place to prevent movement. Joint and other edges shall be formed in the fresh concrete using an edging tool to provide a smooth uniform impression. All edges shall be struck before and after brooming.
 - 1. Install preformed joint filler in accordance with manufacturer's instructions.
 - 2. Position filler against forms, adjacent concrete slabs, and other construction.
 - 3. Pre-score top edge or place expansion joint void-cap over filler. Install filler with top edge slightly below final concrete surface.
 - 4. After concrete has cured apply joint sealant 1/8-inch below the paved concrete surfaces.
- D. Sealed Joints: After the curing period, expansion joints shall be carefully cleaned and filled with approved joint sealant to just below adjacent paved surface in such a manner as to avoid spilling on paved surfaces or overflowing from joint.

3.8 TOOLED SCORING AND FINISH OF CONCRETE TREADS

- A. General: Provide field scoring of all exterior stair treads, including edges of slabs adjacent to the highest tread in a run of stairs at floor levels and intermediate landings.
- B. Layout: Provide matching pattern at all locations, including setback from nosing, setback at sides and width, score depth, and scoring pattern.
 - 1. Setback from Nosing: 1-inch maximum.
 - 2. Setback from Sides: 2 inches maximum.
 - 3. Overall Width including setback from nosing: 4 inches.
 - 4. Spacing of Score Lines: 1/2-inch on center maximum.
 - 5. Depth: 1/8-inch minimum.
- C. Finish: Medium broomed lengthwise for a non-slip finish.

3.9 FINISHING

A. Flatwork and Curbs:

1. Surface Finishes:

- a. Float Finish (for slabs to receive stone tile paving): The surface of the slab shall be screeded and all surface water and laitance removed. Floating shall be started as soon as the screeded surface has stiffened sufficiently. Floating shall be performed by hand using a wood float and shall be the minimum necessary to produce a relatively smooth, level, even-textured surface.
- b. Medium Broom Finish: Obtain by drawing a stiff bristled broom across a floated finish for a nonslip surface. Perform brooming while concrete is still wet enough to receive broom marks to match approved sample. Direction of brooming to be perpendicular to direction of work or as otherwise shown on the drawings
- c. Vertical Form Board Finish: Form with rough-sawn "Standard" or better grade Douglas Fir, nominal sizes of 2x6", 2"x8" and 2"x10". Place form boards in random sequence.
- d. Sandblast Finish: Perform in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish. Use an abrasive grit of the proper type and gradation to expose the aggregate and surrounding matrix surfaces to match sample panel, as follows:

Light Cut:	approximately 1/16" depth
Medium Cut:	approximately 1/8" to 3/16" depth
Heavy cut:	approximately 1/2" to 3/4" depth

Blast corners and edge of patterns carefully, using backup boards in order to maintain a uniform corner of edge line.

Use same nozzle, nozzle pressure and blasting technique as used for sample panel.

Maintain control of abrasive grit and concrete dust in each area of blasting. Clean up and remove all expended abrasive grit, concrete dust and debris at the end of each day of blasting operations.

3.10 DAMPPROOFING

- A. Mop apply one heavy coat of asphalt to a minus 2 inches below finished soil grade on soil side of retaining walls and planters.

3.11 CURING

- A. Cure non-colored exposed concrete in accordance with Caltrans Standard Specifications Section 90.
- B. Cure colored exposed concrete using Curing Compound for Colored Concrete as specified herein.
- C. When applying Curing Compound, apply after initial set of fresh concrete when bleed water has evaporated from surface using a "Hudson-type" airless sprayer in accordance with manufacturer's specifications.
- D. Only water or curing compounds which impart no permanent color or gloss shall be used for curing concrete.

3.12 FIELD QUALITY CONTROL

- A. Walks with inadequate amounts of texture shall be rejected.
- B. Areas of poor workmanship, as determined by the Architect, shall be removed and redone at Contractor's expense.
- C. Positive drainage shall be achieved; areas of ponding shall be redone/repared at contractor's expense. Contractor shall have method of repair approved by Architect/engineer prior to repair.

3.13 CLEANUP

- A. Cleanup: Per Section 01 77 00.

END OF SECTION

03/29/19

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes chain link fencing enclosure at Electrical Switchyard, including the following components:
 - 1. Chain link fencing.
 - 2. Swing gates.
 - 3. Gate hardware for chain link gates.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 32 12 16 "Asphalt Paving and Surfacing" for cast-in-place concrete post footings.

1.2 DESCRIPTION OF FENCE SYSTEMS

- A. Fencing with a fabric height of 120 inches with top and bottom rails. Posts shall be fitted with post tops.
- B. Contractor shall supply a total color chain link fencing system of the design, style and strength defined herein. The system shall include all components (i.e., framework, chain link fabric, gates and fittings) required.

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the construction only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.
- B. American Association of State Highway and Transportation Officials (AASHTO) Standards:
 - 1. AASHTO M181 - Standard Specification for Chain-Link Fence.
- C. ASTM International:
 - 1. ASTM A90/A90M - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 2. ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM A924/A924M - Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 4. ASTM B6 - Specification for Zinc.
 - 5. ASTM B117 - Practice for Operating Salt Spray (Fog) Apparatus.
 - 6. ASTM D1499 - Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics.

7. ASTM D3359 - Test Methods for Measuring Adhesion by Tape Test.
8. ASTM E8/E8M - Test Methods for Tension Testing of Metallic Materials.
9. ASTM F567 - Practice for Installation of Chain-Link Fence.
10. ASTM F626 - Specification for Fence Fittings.
11. ASTM F668 - Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric.
12. ASTM F900 - Specification for Industrial and Commercial Swing Gates.
13. ASTM F934 - Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
14. ASTM F969 - Practice for Construction of Chain-Link Tennis Court Fence.
15. ASTM F1043 - Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
16. F1184 - Specification for Industrial and Commercial Horizontal Slide Gates.

D. Chain Link Fence Manufacturers Institute:

1. CLFMI – Product Manual.

E. United States Federal Supply Service General Services Administration Specifications:

1. RR-F-191/3 - Federal Specification Sheet for Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) - Detail Specification.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Fence and gate posts, rails, and fittings.
 - b. Chain-link fabric, reinforcements, and attachments.
 - c. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

D. Gate Hardware Schedule listing all hardware and cut sheets for each item of hardware.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt at the job site, check all materials to ensure that no damages occurred during shipping or handling.
- B. Store materials in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to existing structures. Verify dimensions by field measurements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Faulty operation of gate operators and controls.
 2. Warranty Period for PVC coated fence framework: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer:
 1. Ameristar Fence Products; www.ameristarfence.com
 2. Master Halco, Inc.; www.fenceonline.com
 3. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: Framework for color chain link fence system shall conform to Ameristar® PermaCoat® PC-20™ (commercial weight), as manufactured by Ameristar® Fence Products in Tulsa, Oklahoma.

2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
 1. Fabric Height: 120 inches.

2. Steel Wire for Fabric: The size of the steel wire core shall be 9 gauge. The finished size of the coated wire shall be 0.148 inch. (See Table 2).
 - a. Mesh Size: 1 inch. (See Table 2).
 - b. Polymer-Coated Fabric: ASTM F 668, Class 2a (Extruded and Bonded) over zinc-coated steel wire.
 - 1) Color: Black according to ASTM F 934.

B. Selvage: Top edge (knuckled) and bottom edge (knuckled).

TABLE 2 – CHAIN LINK FENCE FABRIC						
Finished Gauge	Finished OD (NOM)	Core Diameter (NOM)	PVC Coating Thickness	Mesh Sizes Available	Fabric Extrusion Type	Minimum Breaking Strength
9	0.148 inch	0.097 inch	0.015 – 0.25 inch	2", 1-3/4", 1"	Class 1, 2A	650#

2.3 FENCE FRAMEWORK

- A. Steel material used to manufacture Ameristar® PermaCoat® PC-20™: Zinc-coated steel strip, galvanized by the hot-dip process conforming to the criteria of ASTM A653/A653M and the general requirements of ASTM A924/A924M.
- B. Zinc used in the galvanizing process: Conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, Designation G-90.
- C. Framework: Manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, light industrial weight.
- D. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
 1. Fence Height: 120 inches.
 2. Light-Industrial-Strength Material: Group IC-L, round steel pipe, electric-resistance-welded pipe.
 - a. Line Post: 2.375 inches in diameter.
 - b. End, Corner, and Pull Posts: 3 inches in diameter.
 - c. Gate Posts: 3 inches in diameter.
 3. Horizontal Framework Members: Roof truss framework spans; intermediate, top, and bottom rails according to ASTM F 1043.
 - a. Rails: 1.875 inches in diameter, or as indicated.
 4. Brace Rails: ASTM F 1043.
 5. Metallic Coating for Steel Framework:
 - a. Type A: Not less than minimum 2.0-oz./sq.ft. average zinc coating per ASTM A123/A123M.

- D. Exterior surface of the electrical resistance weld: Recoated with the same type of material and thickness as the basic zinc coating.
- E. PermaCoat® Process: Manufactured framework shall be subjected to the PermaCoat® process, a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.
- F. Coating materials:
1. Material used for the base coat: A (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils.
 2. Material used for the finish coat: A thermosetting “no-mar” TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils.
 3. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours.
 4. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359.
 5. The polyester finish coat shall not crack, blister or split under normal use.
- K. Color of framework: Black in accordance with ASTM F934.
- L. The strength of Ameristar® PermaCoat® PC-20™ shall conform to the requirements of ASTM F1043:
1. The minimum weight shall not be less than 90% of the nominal weight (see Table 1).
 2. The strength of line, end, corner and pull posts shall be determined by the use of 4' or 6' cantilevered beam test.
 3. The top rail shall be determined by a 10' free-supported beam test (see Table 1).
 4. An alternative method of determining pipe strength is by the calculation of bending moment (see Table 1).
 5. Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus.
 6. The yield strength shall be determined according to the methods described in ASTM E8.
 7. For materials under this specification, the 0.2 offset method shall be used in determining yield strength.
 8. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

TABLE 1 – CHAIN LINK FENCE FRAMEWORK											
Fence Industry	Decimal O.D. Equivalent	Pipe Wall Thickness	Weight	Section Modulus Inches	x	Min Yield Strength PSI	=	Max. Bending Moment lb.in.	Calculated Load (lbs.)		
O.D.	Inches	Inches	lb./ft.						10' Free Supported	4' Cantilever	8' Cantilever
1-3/8"	1.315	0.080	1.06	0.0900	x	50,000	=	4,500	150	N/A	N/A
1-5/8"	1.660	0.085	1.43	0.1574	x	50,000	=	7,870	262	164	109
2"	1.900	0.090	1.74	0.2208	x	50,000	=	11,040	N/A	230	154
2-1/2"	2.375	0.095	2.32	0.3734	x	50,000	=	18,670	N/A	389	259
3"	2.875	0.111	3.26	0.6365	x	50,000	=	31,825	N/A	663	442

2.4 SWING GATES

- A. General: ASTM F900 for gate posts and double swing gate types.
 - 1. Gate Leaf Width: As indicated.
 - 2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.
- B. Pipe and Tubing:
 - 1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
 - 2. Gate Posts: Round tubular steel.
 - 3. Gate Frames and Bracing: Round tubular steel.
 - 4. Gate leaves 8-feet high, fabricate of one of the following:
 - a. Type I Steel Pipe: 1.90 inch O.D. weighing 2.72 pounds per lineal foot.
 - b. Type II Steel Pipe: 1.90-inch O.D. weighing 2.28 pounds per lineal foot.
- C. Frame Corner Construction: Welded.
- D. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories with additional horizontal and vertical members to insure proper gate operation.
- E. Use same fabric as for fence, installed with stretcher bars and bands at vertical edges and at top and bottom edges.
- F. Install diagonal cross bracing consisting of 5/16-inch diameter truss rods with drop forged steel turnbuckles where necessary to ensure frame rigidity without sag or twist.
- G. Gate Hardware:
 - 1. General: Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.
 - 2. Hinges for Large Swing Gates: BHMA A156.1, Grade 1, suitable for exterior use.
 - a. Function: 39 - Full surface, triple weight, antifriction bearing.
 - b. Material: Wrought steel, forged steel, cast steel, or malleable iron.
 - c. Barrel Hinges: Basis-of-Design Manufacturer: King Architectural Metals; www.kingmetal.com.
 - 1) 5" Barrel Hinge: Model 44-2003.
 - 3. Latch: Fork type or plunger bar type to permit operation from either side of gate by means of lever handles, and incorporating a padlock eye as integral part of latch. Latch shall be mounted 40-inches above finish grade.
 - 4. Double Gates: Provide gate stops set in concrete to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
 - a. Lockable Cane Bolt, Hoover, 5000-SSSP, Black Powder Coat, with two corrosion resistant pavement cup inserts. Install cup inserts in gate open and closed positions.

HARDWARE GROUP FOR GATES AT ELECTRICAL SWITCHYARD UTILITY ENCLOSURE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	Ea	5" Heavy Duty Barrel Hinge	Model 44-2003	Black	King Architectural Metals
2	Ea	Center Cane Bolt, Lockable	5000-ISSP	Black	Hoover
1	Ea	Locking Hasp		Black	By Gate Mfg.

Provide drilled and sleeved cane bolt holes in concrete at closed and 180 degree open positions.
Mounting Plates and Brackets by Gate Fabricator

2.6 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post Caps: Provide for each post.
 - 1. Provide line post caps with loop to receive top rail.
- C. Rail and Brace Ends: For each gate, corner, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
 - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Finishes:
 - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
 - a. Polymer coating over metallic coating: The coating for all fittings shall be the same PermaCoat® color coating system required for the framework (see Article 2.3); the color of all fittings and fasteners shall be Black in accordance with ASTM F934.
- J. Fasteners: All fasteners shall be stainless steel.

2.7 GROUNDING MATERIALS

- A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.
 - 1. Connectors for Below-Grade Use: Exothermic welded type.
 - 2. Grounding Rods: Copper-clad steel, 5/8" diameter by 8'-0" and 3/4" diameter by 10'-0" as indicated.

2.8 ACCESSORIES

- A. Steel Pipe Sleeves for Chain Link Fence Posts Set in Concrete: Pipe sleeves in concrete retaining walls shall be ASTM A53, Standard Weight (Schedule 40), wrought iron, mild steel, or cast iron sleeves with not less than 1/8-inch space all around between the sleeve and post.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and posts.

3.3 CHAIN LINK FENCE INSTALLATION

- A. General: Install fence in accordance with ASTM F567 and more stringent requirements specified. Do not begin installation before final grading is completed.
 - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

- a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
 - b. Concealed Concrete: Place top of concrete 2 inches below grade to allow covering with surface material.
 - 3. Fence Posts Set in Concrete Retaining Walls: Install fence posts in concrete retaining walls by means of pipe sleeve inserts set and anchored in the concrete. Insert posts into pipe sleeves, plumb and align. Weld fence posts to sleeves as detailed.
 - D. Terminal Posts: Install corner and gate posts according to ASTM F 567.
 - E. Line Posts: Space line posts uniformly at 96 inches on center.
 - F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.
 - G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
 - H. Intermediate and Bottom Rails: Secure to posts with fittings.
 - I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
 - J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches on center.
 - K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to braces at 24 inches on center.
 - L. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- 3.4 GATE INSTALLATION
- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 GROUNDING AND BONDING

- A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Fences Enclosing Electrical Power Distribution Equipment: Ground according to IEEE C2 unless otherwise indicated.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is minimum 6 inches above grade within electrical box. Connect rod to fence with No. 2 AWG conductor at fence corner and middle posts. Connect conductor to each fence component at grounding location.
- D. Connections:
 - 1. Make connections with clean, bare metal at points of contact.
 - 2. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 4. Make above-grade ground connections with mechanical fasteners.
 - 5. Make below-grade ground connections with exothermic welds.
 - 6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Prepare test reports.

3.7 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION

09/21/18

SECTION 32 33 00

SITE FURNISHINGS.

PART 1 – GENERAL

1.1 SCOPE

- A. Provide and install all site furnishings identified in these specifications or shown on the drawings.

1.2 SUBMITTALS

- A. Should it be necessary to propose equipment other than that specified, submit complete manufacturer's information, including catalog cuts, installation procedures and diagrams, maintenance instructions, etc. Provide three copies to the District.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Products named are indicative of the features, form, finish, and quality of the furnishings desired. Products of manufacturers other than those named may be acceptable upon proof of equality. Submit data as specified above for approval by the District.
- B. All products shall be new, delivered to the site in manufacturer's original containers, and protected at all times from damage during shipping, storage, and handling prior to and during installation.

2.2 MANUFACTURERS

- A. The following products shall be as specified on the drawings:
 - 1. Table.
 - 2. Accessible Table.
 - 3. Trash/Recycling Receptacle.
 - 4. Bench.
 - 5. Game Table.
 - 6. Accessible Game Table.
 - 7. Skatestoppers: 6061-T6 aluminum alloy with Type II clear anodize finish. Available at www.skatestoppers.com telephone 619-447-6374.
 - 8. Tree Grates: Mfr: Urban Accessories (877) 487-0488 Model: Flat Rainbow Mat'l: Cast Iron Install flush to surrounding paving, per manufacturer's specifications.
 - 9. Shade Structure: Mfr: USA Shade: PN204-21-WCS-E Finish Frame Color: ---. Distributed by Erik Aingsler.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation of products shall be as shown on the drawings and according to manufacturer's instructions. If discrepancies are found, or if information is lacking, consult with Architect immediately, prior to beginning the work.
- B. Coordinate in-ground installation of site furniture with installation of paving and other adjacent materials.
- C. Protect equipment from damage at all times, until final acceptance of the Work. If damage occurs to any equipment prior to final acceptance, Contractor shall, at his own expense, make replacement to satisfaction of the District.

3.2 PICNIC TABLE AND ACCESSIBLE PICNIC TABLE

- A. Install tables and seat posts in concrete footings per manufacturer's directions. Install footings to allow for 4" cover over concrete footing so that top of footings are below concrete or asphalt paving, covered with the site paving, flush with surrounding grade. Set tops of tables level.

3.3 TRASH RECEPTACLES

- A. Install trash receptacle posts in concrete footings per manufacturer's directions. Install footings to allow for 4" cover over concrete footing so that top of footings are below concrete or asphalt paving, covered with the site paving, flush with surrounding grade. Set tops of trash receptacles level.

3.4 BENCHES

- A. Where benches are to be installed on concrete paving, bolt feet to paving. In all other locations, install legs in concrete footings as detailed on the drawings. Set benches level.

3.5 GAME TABLE AND ACCESSIBLE GAME TABLE

- A. Install tables and seat posts in concrete footings per manufacturer's directions. Install footings to allow for 4" cover over concrete footing so that top of footings are below concrete or asphalt paving, covered with the site paving, flush with surrounding grade. Set tops of tables level.

3.6 SKATESTOPPERS

- A. Install skatestopppers in concrete walls per manufacturer's directions. Set skatestopppers plumb in increments shown on drawings.

3.7 TREE GRATES

- A. Frames shall be cast in place according to manufacturer's instructions. Frames and grates shall be flush in elevation to surrounding curbs or paving.

3.8 BIKE RACK

- A. Install bike racks in concrete footings per manufacturer's directions. Install footings to allow for 4" cover over concrete footing so that top of footings are below concrete or asphalt paving, covered with the site paving, flush with surrounding grade. Set bike racks plumb and level.

3.9 SHADE STRUCTURE

- A. Install shade structure per DSA-approved drawings and manufacturer's instructions in locations shown on drawing.

END OF SECTION

09/21/18

SECTION 32 84 10

IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work in this section consists of furnishing, layout and installing an irrigation system.
- B. Related work specified elsewhere includes:
 - 1. Section 32 92 00, PLANTING.
 - 2. Division 26, ELECTRICAL: Stub-out(s) for controller(s).

1.2 QUALITY ASSURANCE

- A. Manufacturer's Specifications: Follow manufacturer's current printed specifications and drawings in all cases where the manufacturers of articles used in the Contract furnish directions covering points not specified or shown in the drawings.
- B. Ordinances and Regulations: All local, municipal and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the above codes, regulations or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship or construction of a better quality, higher standard, or larger size than is required by the above codes and regulations, the provisions of these Specifications and Drawings shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations.
- C. References, Codes and Standards:
 - 1. AB 325 State of California Model Water Efficient Landscape Ordinance.
 - 2. Water Use Classification of Landscape Species (WUCOLS).
 - 3. American Society of Irrigation Consultants (ASIC) Design Guidelines.
 - 4. California Landscape Standards, California Landscape Contractors Association, (CLCA) Sacramento, California.
 - 5. CAL-OSHA, title 8, Subchapter 4-Construction Safety Orders and Subchapter 7 - General Industry Safety Orders.
 - 6. California Electrical Code.
 - 7. California Plumbing Code (UPC) published by the Association of Western Plumbing Officials.
 - 8. NFPA 24, Section 10.4, Depth of Cover.
 - 9. Underwriters Laboratories (UL): Electrical wiring, controls, motors and devices, UL listed and so labeled.
 - 10. American Society for Testing and Materials (ASTM Internatinoal).
- D. Furnish without extra charge any additional material and labor when required by the compliance with all above mentioned codes and regulations, though the work be not mentioned in these specifications or shown on the drawings.
- E. Reclaimed Water: Contact water company supplying reclaimed water prior to the commencement of installing the irrigation system to coordinate inspection of the work and to verify all codes and regulations regarding use of reclaimed water. Provide all required signage and other warnings.

- F. Experience: Assign a full-time employee to the job as supervisor for the duration of the Contract with a certified landscape technician, irrigation certification through CLCA or minimum of four (4) years experience in landscape irrigation installation.
- G. Labor Force: Provide a landscape installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner acceptable to the Owner's Representative.
- H. Explanation of Drawings:
 - 1. Due to the scale of the Drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. Carefully investigate the conditions affected all of the work and plan accordingly, and furnish all required fittings. Install system in such a manner to avoid conflicts with planting, utilities and architectural features.
 - 2. Do not install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in arc dimensions exist that might not have been considered in engineering. Bring such obstruction or differences to the attention of the Owner's Representative. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

1.3 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show, if applicable, existing above and below grade structures and utilities that are known to the Owner. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. Verify with Owner if As Built drawings are available.
- B. If other structures or utilities are encountered, request Owner's Representative to provide direction on how to proceed with the Work. If a structure or utility is damaged, take appropriate action to ensure the safety of persons and property.
- C. Verify location of existing irrigation systems to be removed and replaced. Maintain any existing systems as required by the Drawings and Specifications, including temporary retention of systems necessary to maintain existing on site and adjacent planting.

1.4 SUBMITTALS, IN ACCORDANCE WITH SECTION 01 33 00.

- A. Materials List:
 - 1. Submit required copies of the cut sheets and a complete list of materials proposed for installation, along with any proposed substitutions clearly identified and obtain the Owner Representative's written approval thereof before proceeding. Use only accepted materials and items of equipment.
 - 2. List all materials by manufacturer's name and model number.
- B. Substitutions:
 - 1. If the Contractor desires to substitute a product, he shall list each item and note it as a "substitution" and provide the following information:
 - a. Descriptive information describing its similarities to the specified product.
 - 2. If the product is approved and, in the opinion of the Owner's Representative, the substituted product does not perform as well as the specified product, the Contractor shall replace it with the specified product at no additional cost to the Owner.

C. Manuals:

1. Prior to the final acceptance of the irrigation system, furnish three (3) individually bound Operation and Maintenance Manuals to the Owner's Representative for use by the Owner. The manuals shall contain complete enlarged drawings, diagrams and spare parts lists of all equipment installed showing manufacturer's name and address. In addition, each Service Manual shall contain the following:
 - a. Index sheet indicating the Contractor's name, address and phone number.
 - b. Copies of equipment warranties and certificates.
 - c. List of equipment with names, addresses and telephone numbers of all local manufacturer representatives.
 - d. Complete operating and maintenance instructions in sufficient detail to permit operating personnel to understand, operate and maintain all equipment.
 - e. Parts list of all equipment such as controllers, valves, solenoids and heads.

D. Record Drawings:

1. Dimension the location of the following items from two (2) permanent points of reference such as building corners, sidewalks, road intersections, etc.:
 - a. Connection to existing water lines/meter.
 - b. Connection to electrical power.
 - c. Gate valves.
 - d. Routing of sprinkler pressure lines (a dimension at least every 100 feet and as required to identify all changes in direction and location).
 - e. Remote control valves.
 - f. Routing of control valves.
 - g. Quick coupling valves.
 - h. All sleeve locations.
 - i. Routing of all control wiring.
 - j. Include all invert elevations below 12".
2. Deliver a reproducible record drawing to the Architect within seven (7) working days before the date of final review. Delivery of the record drawings shall not relieve the Contractor of the responsibility of furnishing required information in the future.

E. Controller Plan:

1. Provide one Irrigation Diagram plan in each controller housing. The plan shall show the area controlled by each valve in different colors and for orientation, any major permanent structure such as buildings and roads.
2. Charts to be waterproof and hermetically sealed between two pieces of transparent 10 mil thick plastic and installed in each controller on the door as accepted by the Owner's Representative no later than the time of the coverage test of the irrigation system.

F. Maintenance Material - supply the following tools to the Owner:

1. Three (3) sets of specialized tools required for removing, disassembling and adjusting each type of sprinkler, valve or other equipment supplied on this project.
2. Two (2) keys for each type of equipment enclosure.
3. Two (2) keys for each type of automatic controller.
4. Two (2) quick-coupler keys and matching hose swivels for each type of quick-coupling valve installed.
5. All lock keys shall be keyed alike.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Furnish and deliver materials in manufacturer's packaging, bearing original legible labeling.
- B. The Contractor is cautioned to exercise care in handling, loading, unloading, and storing PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of the pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented, cracked, or otherwise damaged shall be discarded and, if installed, shall be replaced with new piping.

1.6 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install main line trenching prior to acceptance by Owner's Representative of rough grades completed under another Section.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of events:
 - 1. Sleeves and Conduits: Installation of all sleeves and conduits to be located under paving and through walls prior to placement of those materials.
 - 2. Bubbler Heads: Install after placement of tree, but prior to backfill with planter soil mix.
 - 3. On-Structure Equipment: Install piping and risers after waterproofing is accepted.
 - 4. Sprinkler Head in Pots: Install riser and seal the penetration of the pot prior to backfill of pot with drainage materials and planter soil mix.
 - 5. Coordinate work schedule with Owner to avoid disruption of landscape maintenance of existing landscaping.
 - 6. Install piping prior to soil preparation (planting soil amendment installation).

1.7 WARRANTY

- A. Warranty: Per Section 01 78 36
- B. In addition to manufacturer's guarantees and warranties, work shall be warranted for one (1) year from date of final acceptance against defects in material, equipment and workmanship. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship to the satisfaction of the Owner.
- C. Include a copy of the warranty form in the Operation and Maintenance Manual.

1.8 OPERATION

- A. Routine: Inspect and adjust all spray heads and control valves including raising or lowering of spray head heights to accommodate plant growth and weather conditions.
- B. Controller: Inspect regularly for power interruption and reset clock as required. Adjust station timing to accommodate changes in plant growth and weather conditions.
- C. System Failure: Perform all repairs within one (1) operating period. Replacements to match removed products and materials in all respects. Report promptly all damage not resulting from Contractor's operations. Repair all damage caused by Contractor at no expense to Owner.

- D. Climate Change: Set and program automatic controllers in response to seasonal requirements and requirements of newly planted materials.

PART 2 - PRODUCTS

2.1 PIPE

- A. Pressure Main Line Pipe and Fittings: All PVC fittings shall bear the manufacturer's trademark name, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- B. All main line pipe shall be solvent welded and shall be schedule 40 unless shown otherwise on the Drawings.
 - 1. PVC Pressure Rated Pipe: ASTM D2241 NSF approved Type I, Grade I, solvent welded PVC with an appropriate standard dimension ratio (S.D.R.).
 - 2. PVC Scheduled Pipe: ASTM D1785 NSF approved, Type I,
 - 3. Grade I, solvent welded PVC.
 - 4. PVC Solvent-weld Fittings: ASTM D2466 Schedule 40, 1-2, II-I NSF approved.
 - 5. Solvent Cement and Primer for PVC solvent-weld pipe and fittings: Type and installation methods prescribed by the manufacturer.
 - 6. Connections between Main Lines and RCVs: Schedule 80 PVC (threaded both ends) nipples and fittings unless required otherwise by local jurisdiction.
 - 7. Valves 2-inch and larger shall be flanged only.
 - 8. Copper pipe shall be Type K or Red Brass where threaded joints are required and Type L otherwise.
- C. All lateral line pipe shall be solvent welded and shall be schedule 40 unless shown otherwise on the Drawings.

2.2 CONTROLLER ENCLOSURES

- A. Type: Use one of the following (unless noted otherwise on the Drawings):
 - 1. Stainless steel, NEMA Type 3 rated, with back panel, padlocking hasp and padlock. See Detail for pedestal construction.
 - 2. Le Meur, (714) 822-5100.
 - 3. "Strong Box" available from John Deere, (800) 347-4272.

2.3 REMOTE CONTROL VALVE

- A. Remote Control Valve: As shown on Drawings and with the following minimum requirements:
- B. Remote control valves shall be those normally manufactured for irrigation systems and shall have a slow, consistent speed of closure through entire closing operation, including last portion. To ensure this, the effective diaphragm working area/valve seating opening ratio must be a minimum 3 to 1.
- C. Shall be mechanically self-cleaning to help prevent diaphragm or solenoid port plugging. To ensure this, the flush rod should be tapered to vary the size of the port opening as the diaphragm raises and lowers, thus allowing trapped material to escape. Rod is to be finished with a serrated surface to help scrub trapped material out. Screens not acceptable.
- D. Shall have removable valve seat so valve can be repaired without removal from irrigation line.

- E. Shall have ability to operate manually without the use of wrenches or special keys.
- F. Shall have one-piece solenoid that attaches directly to valve without shunts or clips that can be lost.
- G. Shall have cross top handle to adjust maximum travel of diaphragm to allow "tuning" of valve and closure.

2.4 BOX FOR REMOTE CONTROL VALVE:

- A. Rectangular plastic valve box with lid - Ametek, Brooks, Christy or accepted equal in green color (unless noted otherwise), with non-hinged bolt down lid marked "irrigation". Box body shall have knock outs. Do not saw cut body. Minimum size box as shown on Drawings. Increase box size as required to fit. Valve box lids are to indicate the controller letter and station number of valve as accepted by Owner's Representative. Also refer herein to required polyurethane tag at valve solenoid control wire under Control Wires. Locate the identification in center of the lid. Provide separate box for each valve. Provide H/20 Loading concrete boxes with bolt-down concrete lids for all valves that occur in paved areas.

2.5 CONTROLLER GROUND

- A. Provide each pedestal controller with its own ground rod. Separate the ground rods by a minimum of eight feet. The ground rod shall be an eight foot long by 5/8" diameter U.L. approved copper clad rod or as recommended by controller manufacturer. Install no more than 6" of the ground rod above finish grade. Connect #8 gauge wire with a U.L. approved ground rod clamp to rod and back to ground screw at base of controller with appropriate connector. Make this wire as short as possible, avoiding any kinks or bending. Install within pedestal housing base unless otherwise noted.
- B. Provide each irrigation controller with its own independent low voltage common ground wire.

2.6 CONTROLLER(S)

- A. Controller(s): As shown on Drawings and with the following minimum requirements:
- B. Shall be user-friendly. The controller must have a minimum 20-character readout display describing actions or options, or a full visible panel of buttons, dials, or switches that control all different functions separately.
- C. Shall have the ability to start a programmed sequence of valves a minimum of 5 times a day per program.
- D. Shall have ability to easily and quickly change watering schedules due to change in weather.

2.7 CONTROL WIRES

- A. Connections between automatic controllers and the solenoid-operated electric control valves shall be made with direct burial copper wire 14- AWG-UF 600 volt (minimum size). Pilot wires shall be a color other than white, and shall be a different color for each automatic controller with wires sharing a common trench. Common wires shall be white in color, with a different color stripe for each controller with wiring sharing the same common trench. No stripe is required if multiple controller wiring is not present.

- B. Size of wire shall conform to the remote control valve manufacturer's specification for control wire sizes, but in no case shall the control wire be smaller than #14. Runs over 2,000 lineal feet shall be #12- AWG-UF 600 volt copper wire.
- C. All wire splices are to be made within a valve box, with a copper crimp-type connector, and a "3-M" #DBY splice kit.
- D. Use continuous control wiring between controllers and remote control valves (no splices).
- E. Provide polyurethane tag at valve solenoid control wire that shows the controller number and station number. Also refer to valve box lid identification.
- F. Provide a spare control wire in each RCV box for future.

2.8 SPRAY HEADS

- A. Pop-up as shown on drawings and with the following minimum requirements:
- B. Shall have approximately 30 psi water pressure coming out of nozzle to prevent "fogging" or misting. Shall have pressure-compensating devices.
- C. Shall have ability to prevent low head drainage. Use heads with integral check valves.
- D. Shall not have spray blocked by turf or shrubbery; use minimum 4" pop-ups in turf areas.

2.9 ROTOR HEADS

- A. As shown on drawings and with the following minimum requirements:
- B. Heads shall have exact matched precipitation rates. Radius and precipitation rates must be the same.

2.10 BUBBLER HEADS

- A. As shown on drawings

2.11 QUICK COUPLER VALVES

- A. Quick coupler valves shall be as listed on the Drawings with 10" diameter box and lid similar to isolation valve box described below.

2.12 ISOLATION VALVE

- A. Valves 3 inches and smaller: 125 lb. WSP bronze gate valve with union bonnet, non-rising stem and solid wedge disc. Valves shall be line size.

2.13 DRIP IRRIGATION

- A. Drip Manifold:

1. Pressure Regulator: Preset at 30 psi outlet pressure, 3/4" female threaded inlet and outlet, by RainBird, Torro or equal.
2. Emitters: Xeri-Bug (XB Series) by RainBird, Toro EZ Drip Series, or equal.
3. Flexible PVC: ASTM D2287 algae-resistant flexible PVC as recommended by manufacturer of Drip Emitters.
4. Drip tubing: Conform to A. S. A. E. standards for minimum inside diameter and wall thickness, Minimum 2% carbon black, Salco 3/4" AR Drip PVC flexible drip hose, or equal.
5. 3/4" Y-filter, 200 mesh.
6. Toro DL 2000 Air/Vacuum Relief Valves and In-line Spring Check Valves.
7. 3/4" manual PVC ball valve with extra 3' of hose coiled in valve box.
8. Drip system in accordance with "RainBird Xerigation Low-Volume Landscape Irrigation Design Manual" and as shown on the drawings as required for a complete working system.

2.14 SUBSURFACE DRIP IRRIGATION

- A. As specified herein and as shown on the drawings and in accordance with manufacturer's recommendations. Provide all miscellaneous valves, filters fittings etc. required for a complete, operable system including the following:
 1. Emitters shall be Toro DL 2000 Techline, in-line Teflon impregnated emitter with Netafim Automatic Flush Valves, Toro DL 2000 Air/Vacuum Relief Valves in accordance with "Toro DL-2000 Low-Volume Irrigation Bidding Specifications and Design Details" and as shown on the drawings as required for a complete working system.
- B. Drip Valve Assembly: Size valve box large enough and deep enough to contain assembly and allow convenient access and easy removal of filter screen. Position filter pointed down, approximately 45 degrees.
- C. Pressure regulator: Size regulator in accordance with flow rate. Do not over size. Use factory pre-set regulator at 30 PSI.

2.15 BOX FOR ISOLATION VALVE:

- A. 10" diameter plastic, Ametek, Brooks, Christy with bolt down lid marked "irrigation," or accepted equal. Avoid locating valve in paved areas. Provide H/20 Loading concrete box with bolt-down concrete lid if valve is located in paved area. Obtain location approval by Owner's Representative.

2.16 SWING JOINTS

- A. Sprinklers and Bubblers: Use Dura, Lasco or equal pre-assembled swing joints with O-rings.
- B. Quick Coupling Valve: Dura 1-inch 1-A2-1-11-18 pre-assembled swing joint with O-rings and Dura quick lock to receive stabilizing rod.

2.17 BACKFLOW PREVENTION DEVICE

- A. As required by Code and as shown on Drawings. Verify with Owner if Anti-freeze Jacket is required and provide as required.
- B. Riser assemblies from main line burial depth to backflow preventers shall be Schedule 40 brass pipe.

- C. All metallic pipe and fittings installed below grade shall be painted with two coats of Koppers #50 Bitumastic, or approved equal. Pipes may be wrapped with an approved asphaltic tape in lieu of the liquid-applied coating.

2.18 BACKFLOW PREVENTION DEVICE ENCLOSURE

- A. "Smooth Touch" enclosure without sharp edges, by Strong Box, available from V.I.T., Escondido, CA (800) 729-1314 or equal. Coordinate size of enclosure with plumbing for minimum clearance and size. Enclosure to include hasp and staple to receive padlock. Padlock N.I.C.

2.19 MISCELLANEOUS INSTALLATION MATERIALS

- A. Solvent Cement and Primers for Solvent-weld Joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement proper consistency throughout use.
- B. Pipe and Joint Compound: Permatex: Do not use on sprinkler inlet port.

2.20 MISCELLANEOUS EQUIPMENT/ACCESSORIES

- A. Concrete For Thrust Blocks and Pads: Poured-in-place Class A concrete per Section 90 of the Caltrans Standard Specifications.
- B. Sleeves and Conduits: See Drawings.
- C. Key(s) for Quick-Coupling Valves:
 - 1. Type: Same manufacturer as Quick-Coupling Valve.

2.21 OTHER EQUIPMENT

- A. As shown on Drawings and required for a fully functional irrigation system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Sleeves and Conduits: Verify that all installed sleeving and conduits are undisturbed and are free of defects or errors introduced by the work of other sections.
- B. Water Meter/Water Pressure: Test and verify that existing water pressure is the minimum pressure at maximum system g.p.m. to operate the irrigation system as indicated on the drawings.
- C. Stub-outs: Verify that all stub-outs to be provided under another contract are correctly sized, located and installed as noted on Drawings.
- D. Notification: Submit written notification to Owner's Representative within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

3.2 CONNECTIONS TO SERVICES

- A. Provide and coordinate connection to water meter.
- B. Provide and coordinate connection of irrigation controller to electrical power source.

3.3 INSTALLATION

- A. Install irrigation system components in accordance with this Section, with the Drawings, with the manufacturer's recommendations, and with established industry standards. The Contractor shall do nothing that may jeopardize any manufacturer warranty.
- B. Conduits and Sleeves:
 - 1. Coordination: Provide conduits and sleeves and coordinate installation with other trades.
 - 2. Extent: Install conduits and sleeves where control wires and pipes pass under paving or through walls as shown on Drawings. Extend twelve inches (12") beyond edges of paving and walls and cap ends until ready for use.
- C. Excavating and Trenching:
 - 1. Dig trenches wide enough to allow a minimum of three inches (3") between parallel pipe lines. Provide a minimum cover from finish grade as follows:
 - a. 24-inches Deep: Over pipe on pressure side of irrigation control valve, control wires and quick-coupling valves.
- D. Pipeline Assembly:
 - 1. General:
 - a. Install pipe and fittings in accordance with manufacturer's current printed Specifications.
 - b. Clean all pipes and fittings of dirt, scale and moisture before assembly.
 - 2. Solvent-welded Joints for PVC Pipes:
 - a. Solvents: Use solvents and methods specified by pipe manufacturer.
 - b. Curing Period: Minimum of one (1) hour before applying any external stress on the piping and at least 24 hours before placing the joint under water pressure.
 - 3. Threaded Joints for Plastic Pipes:
 - a. Use Permatex on all threaded PVC fittings except sprinkler heads and quick coupler valve ACME threads.
 - b. Joining: Use strap-type friction wrench only. Do not use metal-jawed wrench. Assemble finger tight plus one or two turns.
 - c. Laying of Pipe:
 - 1) Bedding On-grade: Remove from trench all rocks or clods. Bed pipe in at least 2 inches of soil excavated from trench. Backfill on all sides of piping to provide a uniform bearing.
 - 2) Snaking: Snake pipe from side to side of trench bottom to allow for expansion and contraction. Minimum allowance for snaking is one (1) additional foot per 100 ft. of pipe.
 - 3) Moisture Restrictions: Do not lay PVC pipe when there is water in the trench. Do not assemble PVC pipe unless the pipe is dry.
- E. Control Valves:
 - 1. Install in valve boxes where shown on Drawings and group together where practical. Install box flush with finish grade, not necessarily level. If valve occurs in drainage swale, relocate out of drainage swale as approved by Owner's Representative.

2. Where two or more valves are installed adjacent to each other, provide at least six inches (6") separation. Align boxes in a row, perpendicular with pavement edge.
3. Permanently mark valve box lid with 2" black valve number and controller letter or with numbered metal tag inside box as approved by Owner's Representative.
4. Refer to control wiring for required spare wire in each valve box.

F. Sprinkler Head Installation:

1. Pop-up Heads:
 - a. Place all sprinkler heads in planting areas with top of heads set to finish grade or top of mulch as required.
 - b. Place part-circle pop-up sprinkler heads two inches (2") from edge of and flush with top of adjacent walks, header boards, curbs and mowing bands or paved areas and 12 inches (12") from building foundations at time of installation.
 - c. Set all sprinkler heads in turf to allow for settlement. Adjust as required after settlement. Hold heads two inches (2") clear of pavement edge.
2. Bubblers:
 - a. Coordinate installation with planting contractor to insure timely and proper placement of heads at new planting.

G. Subsurface Irrigation:

1. Install emitters at uniform 18 inches on center and 6 inches deep except where shown otherwise. Adjust spacing on slopes to prevent over watering at base of slopes. Install system in accordance with "Toro DL-2000 Low-Volume Irrigation Bidding Specifications and Design Details" and as shown on the Drawings as required for a complete working system.
2. Provide air/vacuum relief valves at all high points on systems.
3. Provide filter as shown and as recommended by emitters manufacturer.
4. Tape pipe ends during installation and do not allow dirt or debris to enter pipe.
5. Use emitter line with the specified emitter flow rate and emitter spacing. Assemble dripper line to allow water to flow continuously and directly, with no dead ends or dead end loops between control valve and flush valve.
6. Use fittings at sharp bends and do not allow dripper line to kink.
7. Install emitter line around perimeter of planter not more than 3 inches off edge for ground cover and turf, 18 inches maximum for shrub planting.
8. Adjust alternate rows so emitters are spaced in a triangular pattern.
9. Collect water from multiple dripper lines and convey the water to automatic line flush valve.
10. Install flush valve at end(s) of collector laterals so that entire system will flush and be free of dirt and debris.
11. Flush valves shall be open when water is turned on for the first time and after a break in the main or lateral lines. Extend collector lateral as required and locate flush valve at convenient accessible location.
12. Flush the systems weekly through the first month of the maintenance period.
13. Thoroughly saturate soil prior to planting. Provide additional surface watering as required to keep plant root systems moist during planting establishment period.

H. Drip Irrigation:

1. Install system in accordance with "RainBird Landscape Irrigation Design and Specifications Xerigation Products and Details" or equal and as shown on the Drawings as required for a complete working system.
2. Install Toro DL 2000 Air/Vacuum Relief Valves at high points in system.
3. Install manual PVC ball valve with extra 3' of hose coiled in valve box at end(s) of collector laterals so that entire system will flush and be free of dirt and debris.

- I. Automatic Controller:
1. General: Install with lock box cutoff switch per local code and manufacturer's current printed specifications.
 2. Connection to Valves: Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
 3. Labeling: Affix controller letter (i.e., "A") on inside of controller cabinet door with minimum of one-inch (1") high permanent letter.
 4. Irrigation Diagram: Affix a non-fading, waterproof copy of irrigation diagram to cabinet door below controller name. Irrigation diagram to be sealed between two plastic sheets, 20 mil. minimum thickness. Use a legible reduced copy of the Record Drawing for the irrigation diagram clearly showing all valves operated by the controller, station, number, valve size, and type of planting irrigated. Color code area operated by each valve.
- J. Control Wiring:
1. General: Install control wires in common trenches with sprinkler mains and laterals wherever possible. Lay to the bottom side of pipe line. Provide looped slack at valves. Snake wires in trench to allow for contraction of wires. Tie wires in bundles at 10 ft. intervals.
 2. Extra Length: Provide 30 inches (30") extra control wire at each remote control valve splice to facilitate the removal of the remote control bonnet to finish grade without cutting wires.
 3. Spare: Install one unconnected spare control wire running from the controller through each intermediate control valve box.
 4. Size: Minimum size of wire is to be determined strictly by the manufacturer's current printed specifications for remote control valves, but not smaller than #14.
 5. Detection Wire: Install a bare #12 copper wire or greater on top of the PVC supply line for the purpose of possible future mine detection search. Install the control wires on the bottom of the PVC supply line with electrical tape every ten feet (10').
 6. Splicing: Crimp control wire splices at remote control valves. Seal with specified splicing materials. In-line splices will be allowed only on runs exceeding 2500 feet and only in junction boxes.
- K. Closing of Pipe and Flushing of Lines:
1. Capping: Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- L. Rain Shutoff Switch:
1. Install switch in area not affected by irrigation or rain shadow. Provide wires in rigid conduit as accepted by Owner's Representative.
- M. Detection Wire and Warning Tape:
1. Install a bare # 12 copper wire or greater on top of the PVC supply line for the purpose of possible future mine detection search.
 2. Install a continuous PVC irrigation mainline warning tape 12" above the supply line.
- N. CV IDENTIFICATION TAGS: Install in remote control valve box as recommended by manufacturer and as accepted by Owner's Representative.

3.4 MISCELLANEOUS EQUIPMENT

- A. Install miscellaneous equipment with concrete footings, brackets, etc., as required and as recommended by manufacturer.

3.5 FIELD QUALITY CONTROL

A. Testing of Irrigation System:

1. Make hydrostatic tests with risers capped when welded PVC joints have cured at least 24 hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings and fittings exposed.
2. Install two (2) pressure gauges at opposite ends of main line system. Pump system up to a minimum of 125 psi the day preceding the scheduled test and verify that pressure is holding. Inspect system early following day and immediately notify Owner's Representative if the test confirmation must be postponed.
3. Apply continuous static water pressure of 125 psi in accordance with Caltrans Standard Specifications Section 20-5.03H, except after a drop in pressure (5 psi maximum), then the pressure must stabilize and remain stable for a one (1) hour minimum period before acceptance of the test.
4. Leaks detected during tests shall be repaired and test repeated until system passes tests at no additional cost to Owner.

B. Adjustment of the System:

1. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways and buildings. Adjust the arc and radius as applicable.
2. Include as a part of the work any nozzle changes or arc adjustments necessary due to daytime windy conditions during grass establishment period. After grass has been established and watering can be performed during calm early morning or evening hours, make any required adjustments to nozzles and arcs.
3. Set all sprinkler heads perpendicular to finished grades unless otherwise noted on the drawings.
4. When the landscape sprinkler system is completed and before planting, perform a coverage test in the presence of the Owner's Representative to determine if the water coverage for planting areas is adequate.
5. Test controllers individually in the presence of the Owner's Representative and the Landscape Architect. Demonstrate that all control valves operate electronically. Provide vehicles and radio equipment as necessary to expedite this process.
6. Demonstrate to Owner's Representative that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

3.6 BACKFILL AND COMPACTING

- A. General: After system is operating and required tests and reviews have been made, backfill excavations and trenches with clean soil, free of debris.
- B. Backfill for All Trenches: Regardless of the type of pipe covered, compact to minimum 95% density under pavements and 85% under planted areas.
- C. Finishing: Dress off areas to finish grades. Re-dress any areas which subsequently settle.
- D. Owner's testing agency will test backfill compaction in areas under paving.

3.7 MAINTENANCE

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of 2 days prior to any planting.
- B. The Owner's Representative reserves the right to waive or shorten the operation period.
- C. Maintain/repair system for full duration of plant maintenance period.

3.8 REVIEWS PRIOR TO ACCEPTANCE

- A. Notify the Owner's Representative in advance for the following reviews, according to the time indicated:
 - 1. Supply line pressure test and control wire installation: 72 hours.
 - 2. Coverage and controller test: 72 hours.
 - 3. Final review: 7 days.
- B. No reviews will commence without record drawings, without completing previously noted corrections, or without preparing the system for review.

3.9 FINAL REVIEW AND CLEANUP, per Section 01 77 00.

- A. Operate each system in its entirety for the Owner's Representative at time of final review. Any items deemed not acceptable by the Owner's Representative shall be reworked to the complete satisfaction of the Owner's Representative.
- B. Provide evidence to the Owner's Representative that the Owner has received all accessories and equipment as required before final review can occur.
- C. Final acceptance and start of warranty period will occur no earlier than the end of the plant maintenance period.
- D. For time of final review, Contractor shall arrange a meeting with the Owner's maintenance personnel to demonstrate the operation of the irrigation systems automatically in order to verify acceptance and to familiarize the maintenance personnel with the system and recommended programming.

END OF SECTION

09/21/18

SECTION 32 93 00

PLANTING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Furnish labor, material and equipment for the installation of the planting work and the maintenance complete in place as shown on the drawings and as specified.

1.2 RELATED SECTIONS

A. Qualifications:

1. Experience: Assign a full-time employee to the job as foreman for the duration of the Contract with a thorough understanding of standard industry landscape practices and a minimum of four (4) years experience in turf management, landscape installation and maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.
2. Labor Force: Provide a landscape installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner acceptable to the District

B. Requirements:

1. Supervision: Provide direct supervision of the work force at all times by a foreman. Foreman to be present during the entire installation. Notify District of all changes in supervision.
2. All vegetation and lighting shall be installed and maintained in accordance with recommended CPTED Guidelines.
3. Identification: Provide proper identification at all times for landscape firm's vehicles and a labor force uniformly dressed in a manner satisfactory to District.

C. Reference Standards:

1. Manufacturer's recommendations.
2. Nomenclature: "Western Garden Book," Sunset Publishing Co., Menlo Park, CA, 2001 edition or current edition.
3. Plant Material Standards: American Standards for Nursery Stock," American Association of Nurseryman, 230 Southern Building, Washington, D.C. 20005, 1996 or current edition.
4. Staking and guying procedures: "Staking Landscape Trees," University of California Extension, Publication #2576 or current publication.
5. Pruning procedures: "Tree Pruning Guidelines," International Society of Arboriculture, Savoy, IL, 1995 or current edition, conforming to ANSI-A300-1995 tree pruning specifications and guidelines.
6. California Department of Transportation (CalTrans), Standard Specifications, 1992 Edition or current edition. Where referenced herein.

D. Plant Material Standards:

1. Quality and Size of Plants: Conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Use only nursery-grown stock that is free from insect pests and diseases. Any required clearances shall be obtained prior to shipment of plant material.
2. Comply with Federal and State laws requiring inspection for plant diseases and infestations. Submit inspection certificates required by law with each

shipment of plants, and deliver certificates to the District. Obtain clearance from the County Agricultural Commissioner as required by law, before planting plants delivered from outside the County in which planted.

- E. Testing: Performed by approved testing agency: Soil and Plant Laboratory, Inc. Submit test results, analysis and recommendations for site soil, import soil, fertilizer, and organic amendment together, as a package.

1.3 SUBMITTALS: Submit two weeks after award of contract or as noted.

- A. Procedures: In accordance with Section 01 33 00.
- B. Product Data: Supply product data for all proprietary products specified herein. Submit manufacturer's current catalog cuts and specifications for the following:
 - 1. Fertilizers
 - 2. Herbicide
 - 3. Tree Tie and Stake – For 24" box and smaller trees
 - 4. Tree Guying (with Duckbill) – For 24" box or larger trees
 - 5. Root Guard
 - 6. Iron Sulfate
 - 7. Filter Fabric
 - 8. Perforated Drain Pipe
 - 9. Header Board
 - 10. Silva Cell Product Data and Installation Instructions. See specification Sections 32 94 50 and 32 94 56.
- C. Materials Data: Submit complete materials list of plants, soils, amendments, fertilizers and non-proprietary items to be provided under this Section, including source/supplier, size, and quantity.
- D. Samples:
 - 1. Soil Amendment: Submit 1-pint sample.
 - 2. Import topsoil: Submit 1-quart sample to the Landscape Architect two weeks before starting the contemplated hauling of soil.
 - 3. Plants: Submit typical sample of each variety to site for approval by Landscape Architect.
 - 4. Organic Mulch: Submit 1-pint sample.
 - 5. Permeable Backfill (Filter Rock): If required.
- E. Certificates of Compliance for the following:
 - 1. Sod: If accepted by the District, submit information of Sod Farm Company and type and percentage of sod mixture for approval by Landscape Architect.
 - 2. Soil amendment, chemical and physical properties. Do not deliver amendment to the site without prior approval of submittals by Landscape Architect.
 - 3. Quantity of soil amendment delivered to site and incorporated into soil preparation.
 - 4. Import soil, chemical and physical properties.
 - 5. Silva Cell Soil: soil, sand and amendment analyses.
- F. Plants: Submit documentation to the Landscape Architect within 60 days of proposed installation that all plants listed on the plans have been ordered. Substitution of size or species due to unavailability must be requested in writing within 60 days of proposed installation.
- G. Topsoil Analysis: After approval of rough grading and topsoil placement, obtain three representative samples of topsoil taken from approved site locations and submit to approved testing agency for "agricultural suitability" analysis report, including evaluation of physical and chemical properties of soil and recommendations for adding

amendment and fertilizers to the soil. Request testing agency to send one copy of test results directly to the Landscape Architect and one copy to the District. Upon approval of the Laboratory's report by the Landscape Architect, the report recommendations become a part of the Specifications. Adjust the quantities of soil amendment, fertilizer and other additives to conform to the report.

- H. Remediation of planting areas proposed for current built or paved areas: Three representative samples from area shall be taken and kept separate from the other required samples, to allow analysis and recommendations to counteract possible lime treatment. Submit detailed schedule of planting material delivery and staging dates. Request testing agency to send one copy of test results directly to the Landscape Architect and one copy to the District. Upon approval of the Laboratory's report by the Landscape Architect, the report recommendations become a part of the Specifications. Adjust the quantities of soil amendment, fertilizer and other additives to conform to the report.

1.4 PROJECT SITE CONDITIONS

- A. Site Visit: At beginning of work, visit and walk the site with the District's Representative to clarify scope of work and understand existing project site conditions. Identify location of utilities and other improvements. Notify Landscape Architect of conflicts prior to start of work for resolution.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and protect products under provisions of Section 01 66 00 and as specified below.
- B. Materials Delivery and Storage: Deliver manufactured materials in original containers with brand and maker's name marked thereon. Materials in broken containers or showing evidence of damage will be rejected and must be immediately removed from the site. Odorous materials shall not be brought to the site until they are to be used. Deliver quantities necessary to complete the work shown on the Drawings. Any discrepancy in the quantities given on the plans shall not entitle Contractor to additional remuneration.
- C. Deliver Bulk materials to the job site and store to deter mixing with other bulk materials, saturation by rainwater, contamination and/or contact with other deleterious substances or materials.
- D. Plants: Maintain plant material in healthy growing condition at all times. Protect plants from sun and drying winds. Keep plants that cannot be installed immediately in the shade, watered and protected. Landscape Architect reserves the right to reject plants that decline in quality after delivery to site.

1.6 SUBSTITUTIONS

- A. Substitutions shall be per Section 01 25 13 – Products Options and Substitutions and as follows:
 - 1. If proof is submitted to the Landscape Architect that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety with an equitable adjustment of Contract Price.
 - 2. Substantiate and submit proof in writing to the Landscape Architect within 10 days after the effective date of Notice to Proceed.

1.7 WARRANTIES AND REPLACEMENT

- A. Pre-Emergence Weed Killer: Warrant the work against weed growth for a period of four (4) months after application.
- B. Provide written guarantee, on Contractor's letterhead of the following:
 - 1. Plant material and installation: Warrant that all installed plant material will be vigorous, healthy, free of dead or dying branches and branch tips, bearing foliage of normal density and color, and will comply with these Specifications for a period of one year from date of final acceptance.
 - 2. Replacements: Without cost to District, in a timely manner and as directed by the Landscape Architect, replace all plants not meeting the requirements above during and at the end of the Warranty Period. Replace plants that are identified, within one year, as not being true to name as specified or accepted substitution, with the specified plant. Match replacement plants with specimens of the same species in size, and comply with all requirements of this Specification.

PART 2 – PRODUCTS

2.1 PLANTS

- A. Plant nursery grown specimens of the variety, quantity and size. Leave on supplying nursery's labels listing genus, species and variety and do not remove until 10 days before end of maintenance period. The total quantity tabulated is considered approximate and furnished for convenience only.
- B. Install healthy, vigorous, shapely, well branched plants, densely foliated when in leaf, well rooted with no evidence of having been root bound, restricted or deformed, with a structure typical of the species or variety, properly pruned, free of disease, insect pests, eggs or larvae, and free from physical damage or adverse conditions that would prevent thriving growth.
- C. Trees to have sufficient trunk taper and strength so as to remain upright without nursery staking support. Select straight trunks with the central leader intact, undamaged and uncut with all old abrasions and cuts completely callused over. Tree cultivars shall be guaranteed by the nursery to be free of any graft incompatibility defects. Primary lateral scaffold branches shall be no closer than 6 vertical inches apart and radially distributed around the trunk, free of included bark and excessively narrow angles of attachment. All primary lateral scaffold branches shall be established 6.5 feet above the soil grade unless specified as multi – trunk form. No more than 25% of the branches shall have been removed from the tree in the previous six months.
- D. Roots to be healthy and extend to the bottoms and sides of the container with no signs of restriction due to kinked, circular or distorted growth or deformed or circling roots at the liner stage. Rooting to be extensive enough to hold the rootball together during planting, but not so dense as to discourage root establishment into surrounding soils.
- E. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Deliver plants with root balls moist and showing no indication of drought stress. Protect and maintain plants on site by proper storage and watering.
- F. Do not prune plants before delivery.
- G. All plants to be inspected by the Landscape Architect. The District reserves the right to reject any or all plants due to health or structural defects and to inspect plant material

prior to shipment after receiving order confirmation from supplying nursery. Notify Landscape Architect 10 days in advance of all required inspections and delivery to site. In case the sample plants reviewed are found to be defective, the Landscape Architect reserves the right to reject the entire lot(s) of plants represented by the defective sample. Remove unsuitable plants and immediately dispose of off the site.

2.2 GRASSES

- A. Sod: Penn Blue Sports Turf available from Pacific Coast Sod, or approved equal. Machine cut sod to a uniform thickness of 3/4-inch excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends, in vigorous condition, dark green in color, free of disease, weeds and harmful insects. Broken pads, irregularly shaped pieces, and torn and uneven ends will be rejected. No web or mesh.

2.3 FERTILIZERS

- A. Commercial fertilizer, pelleted or granular form, conform to the requirements of Chapter 7, Article 2, of the Agricultural Code of the State of California for fertilizing materials as follows:
 Type A: 6% Nitrogen, 20% Phosphorus Acid and 20% Potash, (6-20-20).
 Type B: 21 gram planting tablets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10- 5) available from Agriform.
 Type C: Complete fertilizer 21% Nitrogen, 7% Phosphoric Acid and 14% Potash (21-7-14).
- B. Maintenance Fertilizer: Type C
- C. Sod Fertilizer: Provided by grower.

2.4 SOIL AMENDMENT

- A. Shredded redwood sawdust or shredded fir and/or pine bark with the following properties:

Percent Passing	Sieve	Designation
100	9.51 mm	3/8"
95-100	6.35 mm	1/4"
80-100	4.76 mm	No. 4
60-100	2.38 mm	No. 8 8 mesh
20-70	1.00 mm	No. 18 16 mesh
0-30	500-micron	No. 35 32 mesh

 Redwood Sawdust
 - 1. Dry bulk density: 270-370 lbs. per cu. yd.
 - 2. Nitrogen content - dry weight basis, 0.8% minimum to 1.2% maximum
 Fir and/or Pine Sawdust
 - 1. Dry bulk density: 450-580 lbs. per cu. yd.
 - 2. Nitrogen content - dry weight basis, 0.5% minimum
- B. Salinity (ECe): 4.0 maximum
- C. Organic Content: 90% minimum
- D. Reaction (pH): 4.0 minimum

- E. Submit sample to the Landscape Architect within two weeks after award of Contract with Laboratory organic amendment analysis report to include above information and iron content. Do not deliver amendment to the site without prior approval of submittals by Landscape Architect.

2.5 IRON SULFATE

- A. Iron Sulfate: Dry Form.

2.6 PLANT BACKFILL

- A. Use a mixture of 2 parts soil from the hole, and 1 part amendment with iron added at the following rates:

1 gallon can plants	-	iron, 1/4 cup
5 gallon can plants	-	iron, 1/3 cup
15 gallon can plants	-	iron, 1/2 cup
24" box and larger	-	iron, 1 cup

Mix the iron, amendment and soil thoroughly.

2.7 SOIL SULFUR

- A. Soil Sulfur: As required by soils analysis.

2.8 MULCH

- A. Organic Mulch - Shredded redwood bark.
- B. Submit samples of organic mulch to the Landscape Architect for approval within two weeks of award of Contract. Resubmit until acceptable to Owner, at no extra cost.

2.9 TREE SUPPORT POLES

- A. Tree Support Poles: Peeled, lodge pole pine logs, clean, smooth, new, and sized as follows:
 - 1. Two-inch (2") diameter by eight feet (8') long for trees less than 8' high and 1" caliper.
 - 2. Three-inch (3") diameter by eight feet (8') long for trees greater than 8' high and 1" caliper.
- B. Bamboo Support Poles. For use when the tree caliper is small and the tree's central leader does not have stability to stay erect on its own without a nursery stake. Typically, the nursery stake abrades the trunk and is so stiff that the trunk does not move and develop its own rigidity. In order to stabilize the trunk so that it is stable but not rigid the contractor is to add a bamboo stake secured to the trunk with flexible nursery tape that extends from the top flex point of the tree to 2" above the top of the root ball. The bamboo stake will assist in holding the trunk up if it is weak and allows for movement of the trunk in the wind which releases hormones that cause the formation of reaction wood, which is what thickens the trunk. The nursery stakes shall be removed and replaced with the bamboo stakes during installation and be removed at the end of maintenance period if the tree trunk can stand on its own.

2.10 TIES

- A. Ties: Flexible strap, 24-inch minimum length without sharp edges adjacent to trunk, V.I.T. (contact phone no.) cinch-tie, or approved equal.

2.11 TREE GUYING

- A. For trees up to 3" caliper, 1/16" galvanized steel cable, with rubber tree collar, 12" minimum long, and secured with cable clamp, and attached to anchor for below-grade location, Duckbill Model 40 DTS, or approved equal. For trees 3" to 6" caliper, 1/8" galvanized steel cable with rubber tree collar, 21" minimum long, and secured with cable clamp, 3" take-up eye to eye turnbuckle, and attached to anchor for below-grade location, Duckbill Model 68 DTS, or approved equal.
- B. Each guy wire shall be installed with 1" PVC pipe, 4' long sleeve, as warning device.

2.12 ROOT GUARD

- A. Root Guard: UBP 24-2 for use along curbs as manufactured by Deep Root Corporation (800/898-0563), or approved equal.

2.13 PLANTING SOIL (TOPSOIL)

- A. Planting soil is defined as on-site surface soil or import topsoil as required to complete the project. Satisfactory planting soil shall be free of subsoil, heavy or stiff clay, lumps, stones, and other objects over 4" in diameter, and without weeds, roots, and other objectionable material.

2.14 IMPORTED TOPSOIL

- A. Import topsoil in all areas that were originally paved or with poor soils and as needed to complete the job with the following properties:
 - 1. Fertile, friable, natural, productive, even textured soil containing a normal amount of humus, capable of sustaining healthy plant life, free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash or other harmful substances, with no nematodes or other noxious animal life or toxic substances. Obtain soil from well-drained, arable land, where no noxious weeds such as Morning Glory, Sorrel, or Bermuda Grass are growing. "Sandy Loam" or "Loam" as classified in accordance with USDA Standards.
 - 2. Imported planting soil pH value to be between 6.0 and 7.5 with boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degrees C. of less than 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.
 - 3. Silt and clay content of imported planting soil is not to exceed that of the existing soil it is to be placed over.
 - 4. Do not deliver topsoil to the site until Landscape Architect has reviewed and approved soils report and/or prior to approval of submittals by Landscape Architect.
- B. Quality Control:
 - 1. Make the site of the source of supply of planting soil available to the Landscape Architect for observation and approval prior to any hauling or placing of soil.
 - 2. Submit a soil analysis report by approved testing agency showing chemical analysis stating source, fertility, agricultural suitability and particle size

distribution of the soil. Include testing agency's recommendations for amending the soil.

3. Following approval of the sample, provide a one-half cubic yard sample, which shall be stored at the site of work for comparison with subsequent loads of soil. The comparison sample will be stored with the Landscape Architect until the furnishing of all soil has been completed and accepted.
4. No topsoil shall be delivered to the site until Landscape Architect has reviewed and approved soils report and submittals.

2.15 PRE-EMERGENCE WEED KILLER

- A. Pre-Emergence Weed Killer: Clean non-staining as recommended by a licensed pest control specialist and as approved by District Representative in compliance with the District's Integrated Pest Management Policy.

2.16 FILTER FABRIC

- A. Filter Fabric: Polyester non-woven filter fabric with uniform fiber distribution by "Terra Bond" #1115, "Mirafi, Inc." #140NS, or approved equal.

2.17 PERFORATED DRAIN PIPE

- A. Perforated Drain Pipe: PVC Smooth Wall Perforated Drain Pipe: Size as noted on the drawings and manufactured to meet CalTrans Standard Specification Section 68 and AASHTO M278, or approved equal.

2.18 PERMEABLE BACKFILL (FILTER ROCK)

- A. Permeable Backfill (Filter Rock): Permeable backfill used in subsurface drain installations to be Class 2 permeable material in conformance with Section 68 "Subsurface Drains" of the Standard Specifications.

2.19 SILVA CELL

- A. Silva Cell: Silva Cell See Specification Sections 32 94 50 and 32 94 56. Available from:
Shawn Freedberg
DeepRoot Green Infrastructure, LLC
530 Washington Street
San Francisco, CA

Direct: (415) 746-1549
Mobile: (415) 580-0286

shawn@deeproot.com

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Progress observations: In addition to the installation observations specified below, the Landscape Architect may make periodic progress observations.

- B. Installation observations: Request at least 4 working days in advance:
 - 1. Observation of finish grading.
 - 2. Observation of plant material upon delivery to site.
 - 3. Observation of layout and placement of plant material at time of planting.
 - 4. Observation of any planting drainage issues, as identified by Contractor.
- C. Maintenance Observations: For the purpose of establishing the start of Maintenance Period and observing completion of the Work of this Section through Final Acceptance. Request at least 7 working days in advance:
 - 1. Observation for Maintenance Period commencement.
 - 2. Observation for Final Acceptance.

3.2 ORDERING, REVIEW AND ACCEPTANCE OF PLANT MATERIAL

- A. Ordering: 60 days before start of planting work, submit written certification to Landscape Architect of the quantity, species and source of plant material ordered.
- B. Upon plant delivery, arrange material so that canopies or branch tips are not touching so that Landscape Architect can review plant material at project site.
- C. Do not install material that has not been reviewed and accepted by Landscape Architect.
- D. Arrange and pay for permits and inspections required for delivery of plant material.

3.3 FINE GRADING AND SOIL PREPARATION

- A. Planting Soil Placement: For Silva Cell soil and placement see Specification Sections 32 94 50 and 32 94 56.
 - 1. Inspect planting areas and remove all asphalt, concrete, base rock and other foreign material. Spread type A Fertilizer (6-20-20) over all subgrade areas at the rate of 15 pounds per 1,000 square feet prior to ripping. Rip in two directions all planting areas full depth of compacted fill (to a minimum of 12 inches) into undisturbed native soil prior to backfilling. Scarification of any planting area that cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the Landscape Architect to the specified depth to ensure proper drainage. Uniformly distribute and spread planting soil backfill in planting areas in layers not to exceed 12" and compact to a maximum of 85% relative compaction.
 - 2. When the planting soil differs in clay and silt content from the subsoil it is to be placed upon, install a 4-inch thick lift of planting soil on the subgrade and rototill into the subgrade 6 inches deep before installing the remaining required planting soil.
 - 3. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.
 - 4. Water settling, puddling, and jetting of fill and backfill materials, as a compaction method is not acceptable.
 - 5. Maintain moisture content of materials during compaction operations within required moisture range to obtain indicated compaction density.
 - 6. Provide a minimum of 12 to 18 inches depth in planting areas as shown on drawings and as outlined in the specifications. Where soil is to be replaced by plants and organic amendments, make allowance so that when finish grading has begun, there will be no deficiency in the specified depth of prepared beds.
- B. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the Landscape Architect of any discrepancy

between the Drawings and Specifications and actual conditions and secure approval to proceed.

- C. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.
- D. Thoroughly wet down the planting areas and confirm irrigation coverage and operation. Allow soil to dry so as to be workable.
- E. Drag to a smooth, even surface. Grade to form all swales, pitch to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas that shall be uniformly level or sloped between finish elevations. Provide surface drainage of planted area. Correct drainage conditions that may be detrimental to the growth of plant material or which will result in excessive retention of water in tree pits. Minimum slope in landscape areas shall be two percent (2%) or as shown on drawings. Slope away from buildings.
- F. Hold finish grade and/or mulch surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc.
- G. Spread soil amendment, fertilizers and other additives evenly over installed and rough graded topsoil in all planting areas including turf, ground cover and shrub areas at the rates specified in the soils analysis report. For bid basis, use the following rates:
 - 1. Soil Amendment: 6 cubic yards per 1,000 square feet.
 - 2. Fertilizer: Type A (6-20-20) at 20 lbs. per 1,000 square feet.
 - 3. Iron Sulfate: 10 lbs. per 1,000 square feet.
 - 4. Soil Sulfur: 25 lbs per 1,000 square feet.Rototill above additives into soil 6 to 8 inches deep. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.
- H. After the rototill work, float areas to a smooth, uniform grade as indicated on the drawings. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Remove rocks, sticks and debris 2 inches or larger in size in turf areas and 3 inches or larger in shrub and ground cover areas. Secure approval of the grade by the Landscape Architect before any planting.
- I. Scarify all planting areas that become compacted prior to planting.
- J. For areas to receive sod, apply sufficient water to completely moisten the area to a depth of 12 inches after amendments are worked into the soil. Leave areas undisturbed for a period of not less than twenty (20) days. Water as frequently as necessary to keep areas moist during the twenty-day period.

Weed the area after the twenty-day period has expired and the soil has dried sufficiently to permit work without excessive compaction. Restore surface to finish grade. Chemical weed control will be permitted in compliance with the District's Integrated Pest Management Policy.

Following completion of amendment incorporation, the District reserves the right to retest the amended topsoil to test for compliance with specifications by the approved soils test. If retesting is to be done, three representative samples shall be taken in areas approved by the Landscape Architect. Send samples to the approved soils testing agency for analysis at the District's expense. Additional amendments will be supplied and incorporated by Contractor (at no additional cost to the Contract) as noted in test results. All subsequent testing for soil preparation non-compliance to be at Contractor's expense.

3.4 SODDED TURF PLANTING

- A. Lightly roll surface and reshape to level humps and hollows. Secure the Landscape Architect's approval before sodding. Do not sod on dry soil.
- B. Lay first strip of sod along a straight line (use a string in irregular areas). Butt joints tightly, do not overlap edges. On second strip, stagger joints. Use a sharp knife to cut sod to fit curves, edges and sprinkler heads.
- C. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to sod and to water until installation is complete.
- D. After laying all sod, roll lightly to eliminate irregularities and to form good contact between sod and soil. Avoid a heavy roller and excessive initial watering.
- E. Thoroughly water the completed sod surface to at least 8 inches deep. Repeat sprinkling at regular intervals to keep sod moist at all times until rooted. After sod is established, decrease frequency and increase amount of water per application.
- F. Protect turf areas by erecting fences, barriers and signs necessary to prevent trespass. Keep barriers neat and well maintained.

3.5 HANDLING OF PLANTS

- A. General: Prevent damage to plant material. Lift and handle plants only from bottom of rootball.
- B. Access: Inspect Project site and become familiar with the accessing requirements and restrictions. At time of submitting bid, provide written notice of any conditions that would prevent installation of the specified plant material.

3.6 TREE AND SHRUB PLANTING

- A. Do not plant material that has not been reviewed by Landscape Architect upon delivery to the project site, or that has been rejected for any reason. Do not plant under unfavorable weather conditions.
- B. Landscape Architect will review, for conformance to design intent, locations of all plants in the field prior to planting. Notify Landscape Architect and schedule layout review sufficiently in advance of planting to allow for review and adjustment without disrupting construction schedule. Stake layout of trees in field before installing irrigation. Mark tree and shrub locations on site using stakes, gypsum or similar approved means and secure location approval by the Landscape Architect before plant holes are dug. Adjust as necessary prior to planting. Landscape Architect reserves the right to make minor adjustments in the layout of all plant material; adjust irrigation system as necessary.
- C. Excavate container grown tree, shrub and vine pits as follows. If rocks, underground construction work, tree roots or other unknown obstructions are encountered in the excavation of plant holes; Landscape Architect may select alternate locations. Report all such conditions and cost estimate for removing the obstructions to a depth of not less than 6 inches below the required hole depth. Obtain Landscape Architect's instructions prior to proceeding with the work affected.

Excavation for	Width	Depth
Boxed Trees	Box + 24"	Box + 12"
Canned Trees (15 gc)	Can + 18"	Can + 12"
Canned Shrubs (1 or 5 gc)	Can + 12"	Can + 12"

- D. Break and loosen the sides and bottom of the pit to ensure root penetration. Prior to planting all specified plants, 'test drain' representative sample planting areas. Fill holes with water; any retention of water in the plant pits for more than 24 hours shall be brought to the attention of the Landscape Architect before planting proceeds. Report failure of drainage test in writing to Landscape Architect for all areas not draining, and all soil conditions considered detrimental to growth of plant material. State condition, and proposal and cost estimate for correcting the condition. Obtain Landscape Architect's instructions prior to proceeding with work affected. Repeat drainage testing and correction of conditions until tests are passed. Failure to perform drainage tests, or to notify Landscape Architect in writing of conditions specified above, renders Contractor responsible for all plant failure that occurs as a result of inadequate drainage or detrimental soil conditions, as determined by Landscape Architect.
- E. Backfill plant holes with mix as specified, free from rocks, clods or lumpy material. Backfill native soil free of soil amendments under rootball and foot tamp to prevent settlement. Backfill remaining one-half of the hole with soil mix and place plant tablets (Type B fertilizer) 3 inches below surface of rootball and 1/2-inch from roots at the following rates:
- 1 gallon can plant - 1 tablet
 - 5 gallon can plant - 3 tablets
 - 15 gallon can plant - 6 tablets
 - 24-inch box plant - 6 tablets
 - 36-inch box plant - 8 tablets
- F. Carefully remove and set plants without damaging the rootball. Do not install plants with damaged rootballs. If root bound gently tease out circling roots by hand as required. Cutting or scoring of rootballs to be done only if species is known to be tolerant of such treatment. Superficially cut tolerant plants' edge roots vertically on three sides using a knife. If trees are root bound, gently roughen sides of rootball to depth of 1 to 2 inches to loosen and spread encircling roots. Cut roots that are too stiff to untangle. Remove bottom of plant boxes before planting. Remove can or sides of boxes and nursery stakes after positioning the plant and partially backfilling.
- G. Set plants in backfill with top of the rootball 2 inches above finished grade. Backfill remainder of hole and soak thoroughly by jetting with a hose and pipe section. Water backfill until saturated the full depth of the hole. Thoroughly water all plants immediately after planting, eliminating air pockets. Prevent erosion.
- H. Build 6" high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in turf areas.
- I. Stake and/or guy trees as detailed. Drive stake until solid and remove excess stake protruding above top tree tie to prevent rubbing against branches. Allow 1 to 3 inches sway in trunk or branches; do not pull tight. If caliper is small and cannot support its central leader, install bamboo stake in place of nursery stake as noted.
- J. Mulch watering basins with organic mulch to 2-inch depth and thoroughly water. No mulch is Required around trees in turf areas.

3.7 PRE-EMERGENCE WEED KILLER

- A. Pre-Emergence Weed Killer: Apply pre-emergence weed killer in all areas to receive ground cover planting. Work shall be done by a pest control specialist, licensed by the State of California. Obtain approval of the finish grades prior to applying weed killer and coordinate planting and watering with the pest control specialist prior to planting.

Obtain approval by District Representative and apply in compliance with the District's Integrated Pest Management Policy.

3.8 GROUND COVER PLANTING

- A. Ground Cover Planting: Plant in neat, straight, parallel and staggered rows as indicated on plan. Plant first row one-half required ground cover spacing behind adjacent curbs, structures, or other plant bed limits. Plant ground cover to edge of water basins of adjacent trees and shrubs.

3.9 MULCH

- A. Mulch: Mulch all shrub and ground cover areas with organic mulch to a 3-inch depth. Mulch ring at trees in lawn areas to be 3' diameter for up to 36" box. Do not pile mulch around crowns of plants. Keep root crown free of mulch.

3.10 WATERING

- A. Watering: Water all trees, shrubs and ground cover immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first 3 weeks of plant establishment as necessary.

3.11 MAINTENANCE OF PLANTING

- A. Maintenance of Planting: Maintain plants from time of delivery to site until final acceptance of landscape installation.

3.12 PRE-MAINTENANCE PERIOD REVIEW AND APPROVAL OF PLANTING

- A. Receive approval of the installed planting prior to commencement of planting establishment maintenance period. Notify the Landscape Architect a minimum of seven (7) days prior to requested review. Before the review, complete the following:
 1. Complete all construction work.
 2. Present all planted areas neat and clean with all weeds removed and all plants installed and appearing healthy.
 3. Plumb all tree stakes.
 4. Sod or reseed all turf areas.
 5. No partial approvals will be given.
 6. Settlement: Reset plants that shift or settle before end of maintenance period. Crowns of trees shall be at the following minimum height above surrounding finish grade at end of maintenance period: 36 inch box and smaller - 2 inches.

3.13 PLANTING ESTABLISHMENT MAINTENANCE

- A. General Requirements:
 1. The planting establishment maintenance period required shall be 120 calendar days after all planting is complete, turf is seeded, and installation approved. A longer period may be required if the turf is not thick, vigorous and even, or if the plant material is not acceptably maintained during the maintenance period. The maintenance period may be suspended at any time upon written notice to the Contractor that the landscaping is not being acceptably maintained, and

- the day count suspended until the landscape is brought up to acceptable standards as determined by the Landscape Architect.
2. Planting establishment maintenance immediately follows, coincides with, and is continuous with the planting operations, and continues through turf installation, and after all planting is complete and accepted, or longer where necessary to establish acceptable stands of thriving plants.
 3. Protect all areas against damage, including erosion and trespass, and provide proper safeguards. Maintain and keep all temporary barriers erected to prevent trespass.
 4. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work or maintenance.
 5. Repair all damaged planted areas, and replace plants and reseed or resod turf immediately upon discovery of damage or loss.
 6. Check sprinkler systems at each watering; adjust coverage and clean heads immediately. Adjust timing of sprinkler controller to prevent flooding.
 7. Maintain adequate moisture depth in soil to ensure vigorous growth. Check rootball of trees and shrubs independent of surrounding soils and hand water as required.
 8. Keep Contract areas free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over 1-inch high at all times.
- B. Tree, Shrub and Ground Cover Maintenance:
1. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the Landscape Architect.
 2. Keep watering basins in good condition and weed-free at all times.
 3. Replace all damaged, unhealthy or dead trees, shrubs, vines and ground covers with new stock immediately, size as indicated on the drawings.
- C. Turf:
1. Maintain during the entire establishment period. Cut as frequently as growth of grass requires. Cut to a height of two inches (2"), unless otherwise directed by the Landscape Architect.
 2. Maintain appropriate soil moisture at all times for healthy and vigorous turf grass.
 3. Trim edges of turf at paving and headerboards at time of second cutting, and at each later cutting.
 4. Keep the designated area under trees free of turf at all times. Do not create low area around base of tree.
 5. Keep turf areas free of undesirable weeds and grasses by the application of suitable selective weed killers or hand pulling.
 6. Reseed all damaged areas as soon as evident.
 7. Repair any hollow, settled or eroded areas by filling, rolling and resodding. Raise irrigation heads as required to accommodate turf growth during the plant establishment maintenance period.
- D. Fertilizing:
1. Upon approval and after submitting fertilizer delivery tags, fertilize all turf and ground cover areas by broad-casting Type C (21-7-14) fertilizer at the rate of 5 lbs. per 1,000 square feet evenly throughout, and reapply every forty-five (45) days until acceptable or as appropriate to prevailing climatic conditions and type of plant or turf grass.
 2. Apply ammonium sulfate fertilizer as necessary to maintain vigorous, green grass between fertilizings mentioned above.

3.14 FINAL PLANTING REVIEW AND ACCEPTANCE

- A. At the conclusion of the planting establishment period, schedule a final review. On such date, all project improvements and all corrective work shall have been completed. If all project improvements and corrective work are not completed, continue the planting establishment, at no additional cost to the District, until all work has been completed. This condition will be waived by the District under such circumstances wherein the District has granted an extension of time to permit the completion of a particular portion of the work beyond the time of completion set forth in the Agreement.
- B. Submit written notice requesting review at least 10 days before the anticipated review.
- C. Prior to review, weed and rake all planted areas, repair plant basins, mow and edge turf, plumb tree stakes and guys, remove bamboo tree stakes if acceptable, clear the site of all debris and present in a neat, orderly manner.

END OF SECTION

09/21/18

SECTION 32 94 50

SILVA CELLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Furnishing and installing Silva Cell system, including: geotextile, geogrids, aggregates, sub base material, backfill, drainage system, root barrier, compost, and the installation of planting soil.
- B. Related Sections:
 - 1. Specification Section 32 93 00 – Planting.
 - 2. Specification Section 32 94 50 – Planting Soil for Silva Cells.

1.3 DEFINITIONS

- A. Aggregate Sub Base (below Cell frame): Aggregate material between the bottom of the Silva Cell frame and the compacted subgrade below, designed to distribute loads from the frame to the subgrade.
- B. Aggregate Base Course (above Cell deck): Aggregate material between the paving and the top of the Silva Cell deck below designed to distribute loads across the top of the deck.
- C. Aggregate Setting Bed – For Pavers (above Cell deck): Aggregate material between the aggregate base course and unit surface pavers, designed to act as a setting bed for the pavers.
- D. Backfill: The earth used to replace or the act of replacing earth in an excavation beside the Silva Cell frames to the excavation extents.
- E. Bridging Slab: Bridging slabs are to be used in locations where spacing larger than 3 inches is necessary between Silva Cell frames.
- F. Compost: Organic material subjected to composting processes
- G. Finish Grade: Elevation of finished surface of planting soil or paving.
- H. Geogrid: Net-shaped synthetic polymer-coated fibers that provide a stabilizing force within soil structure as the fill interlocks with the grid.
- I. Geotextile: A geosynthetic fabric, applied to either the soil surface or between materials, providing filtration, separation, or stabilization properties.
- J. Inspection Riser for Drainage: Vertical, perforated pipe installed at tree openings to allow access for visual inspection of water levels at base of Silva Cell system. One riser for every three trees.

- K. Inspection Riser for Soil: Vertical pipe installed within pavement section to allow access for visual inspection of soils within Silva Cell system. One riser for every two trees.
- L. Irrigation: Trees planted in the Silva Cell system must receive adequate water to ensure survival of the living system during periods of drier weather.
- M. Planting Soil: Soil as defined in Section 32 94 56, Planting Soil for Silva Cells, intended to fill the frames and other planting spaces.
- N. Root Barrier: Plastic root diversion device.
- O. Root package: The earthen package containing the root system of the tree as shipped from the nursery.
- P. Silva Cells: Plastic structural cellular system with posts, beams and decks designed to be filled with planting soil for tree rooting and support of vehicle loaded pavements. The soil within the cells may also be used as part of rainwater filtering, retention and detention systems.
- Q. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.
- R. Strongback: Modified Silva Cell frame designed to be attached to top of Silva Cells for stability while installing planting soil and backfill.
- S. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- T. Tree: A perennial woody plant with one or several trunks and a distinct crown and intended to become large enough to shade people and or vehicles.
- U. Zip Tie: A tensioning device or tool used tie similar or different materials together with a specific degree of tension.

1.4 PRECONSTRUCTION MEETING

- A. Prior to the start of the installation of Silva Cells, meet at the site with the landscape architect, general contractor and the Silva Cells installer to review installation layout, procedures, means and methods.

1.5 SUBMITTALS

- A. Upon forty-five (45) days prior to start of installation of items in this section, the Contractor shall provide submittals required in this section to the landscape architect for review and approval.
- B. Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.
 - 1. For bulk materials, including soils and aggregates, Include analysis of the materials by a recognized laboratory made that demonstrates that the material meets the specification requirements.
 - 2. Silva Cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
- C. Silva Cell System Mock Up:

1. Prior to the installation of Silva Cells, construct a mock up of the complete installation at the site. The installation of the mock up shall be in the presence of the landscape architect.
 2. The mock up shall be a minimum of 100 square feet in area and include the complete Silva Cell system installation with sub base compaction, drainage installation, base course aggregate and geotextile as required, geogrids, backfill, planting soil with compaction, decks, top geotextile and all necessary accessories.
 3. The mock up area may remain as part of the installed work at the end of the project provided that it remains in good condition and meets all the conditions of the specifications.
- D. Compaction testing results: Submit results of all compaction testing required by the specifications including the bulk density test of the mock up and installed soil to the landscape architect for approval.
- E. Qualification Data: Submit documentation of the qualifications of the Silva Cell installer sufficient to demonstrate that the installer meets the requirements of paragraph "Quality Assurance".

1.6 SEQUENCING AND SCHEDULING

- A. General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- B. Schedule all utility installations prior to beginning work in this section.
- C. Where possible, schedule the installation of Silva Cells after the area is no longer required for use by other trades and work. Protect installed Silva Cells from damage in the event that work must occur over or adjacent to the completed Silva Cells.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Silva Cells and related products shall be installed by a qualified installer whose work has resulted in successful installation of planting soils and planter drainage systems, underground piping, chambers and vault structures.
 1. Submit list of completed projects of similar scope and scale to the Owner, demonstrating capabilities and experience.
 2. The installer and the field supervisor shall have a minimum of five years successful experience with construction of similar scope in dense urban areas.
 3. Installer's Field Supervision: Installer is required to maintain an experienced full-time supervisor on Project site when work is in progress. This person shall be identified during the Pre-installation Conference, with appropriate contact information provided, as necessary. The same supervisor shall be utilized throughout the Project, unless a substitution is submitted to and approved in writing by the Owner.

1.8 LAYOUT AND ELEVATION CONTROL

- A. Provide layout and elevation control during installation of Silva Cells. Utilize grade stakes, benchmarks, surveying equipment and other means and methods to assure that layout and elevations conform to the layout and elevations indicated on the plans.

1.9 PERMITS AND CODE COMPLIANCE

- A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary permits/approvals from all such authorities.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, if applicable. Protect materials from deterioration during delivery and while on the project site.
- B. Bulk Materials:
 - 1. Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.
 - 2. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect the finish material.
- C. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the project limits as needed.
- D. Silva Cells: Protect Silva Cells from damage during delivery, storage and handling.
 - 1. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris
 - 2. Handling is to be performed with equipment appropriate to the size (height) of Cells and site conditions, and may include, hand, handcart, forklifts, extension lifts, or small cranes, with care given to minimize damage to Silva Cell frames, decks and adjacent Silva Cells.

1.11 PROJECT CONDITIONS

- A. Verification of Existing Conditions and Protection of New or Existing Improvements: Before proceeding with work in this section, the Installer shall carefully check and verify all dimensions, quantities, and grade elevations, and inform the landscape architect immediately of any discrepancies.
 - 1. Carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging. Verify the location of all aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system, and take proper precautions as necessary to avoid damage to such improvements and plants.
 - 2. In the event of conflict between existing and new improvements notify the landscape architect in writing and obtain written confirmation of any changes to the work prior to proceeding.
 - 3. When new or previously existing utility lines are encountered during the course of excavation, notify the landscape architect in writing and make recommendations as to remedial action. Proceed with work in that area only upon approval of appropriate remedial action. Coordinate all work with the appropriate utility contractors, utility company or responsible public works agency.
- B. Weather Limitations: Do not proceed with work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.

- C. Protect partially completed Silva Cell installation against damage from other construction traffic with highly visible construction tape, fencing, or other means until construction is complete. Prevent all non-installation related construction traffic over the completed Silva Cell installation; allowing only loads less than the design loads.

1.12 PROTECTION

- A. Protect open excavations and partially completed Silva Cell installation from access and damage when work is in progress, and following completion with highly visible construction tape, fencing, or other means until all construction is complete.

1.13 PROJECT WORK

- A. Coordinate installation with all other work that may impact the completion of the work.

1.14 WARRANTY

- A. Silva Cell manufacturer's product warranty shall apply. Submit manufacturer's product warranty.

PART 2 – PRODUCTS

2.1 SILVA CELLS

- A. Fiberglass-reinforced polypropylene structures including frames and decks designed to support sidewalk loads and designed to be filled with soil for the purpose of growing tree roots, and rainwater filtering, detention and retention.
- B. Silva Cell Frames: 16 inches x 24 inches x 48 inches.
- C. Silva Cell Deck: 2 inches x 24 inches x 48 inches. Deck to include manufactured installed galvanized steel tubes.
- D. Silva Cell Strongback: 24 inches x 48 inches x 6 inches modified Silva Cell Frame units designed to stiffen and align the frames as planting soil and backfill material is placed. Strongbacks are to be removed prior to placing decks. They are to be reused as the work progresses.
- E. Silva Cell Deck Screws: Manufacturer's supplied stainless steel screws to attach decks to frames.
- F. Manufacturer: DeepRoot Partners, L.P. (Deep Root); 530 Washington Street, San Francisco, CA 94111; 415.781.9700; 800.458.7668; fax 415.781.0191; www.deeproot.com.

2.2 ANCHORING SPIKES

- A. 10" long X 19/64" diameter, spiral, galvanized timber spikes. Utilize 4 spikes in each frame on the first layer of Silva Cells to anchor the frames to the aggregate sub base.

2.3 SOLID AND PERFORATED DRAIN LINES

- A. Any solid or perforated drain lines to be specified by project engineer

2.4 INSPECTION RISER FOR DRAINAGE (Where Applicable)

- A. Rigid, PVC schedule 40 pipe, 4" diameter.
- B. Cap: Cast Iron solid threaded cleanout designed to fit standard PVC schedule 40 pipe-fittings.
 - 1. Products meeting this specification: Zurn Z 1440, Cast Iron Adjustable Cleanout, Zurn, 1801 Pittsburgh Avenue, Erie, PA 16502, 1-877-ZURN-NOW. <http://www.zurn.com/>

2.5 INSPECTION RISER FOR SOIL (Where Applicable)

- A. Rigid, PVC schedule 40 pipe, 6" diameter.
- B. Cap: Cast Iron solid threaded cleanout designed to fit standard PVC schedule 40 pipe-fittings.
 - 1. Products meeting this specification: Zurn Z 1440, Cast Iron Adjustable Cleanout, Zurn, 1801 Pittsburgh Avenue, Erie, PA 16502, 1-877-ZURN-NOW. <http://www.zurn.com/>

2.6 GEOGRID

- A. Geogrid shall be woven polyester fabric with PVC coating, Uni-axial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, acids.
 - 1. Tensile strength at ultimate: 1850 lbs/ft minimum by ASTM D6637 test method.
 - 2. Creep reduced strength: 1000 lbs/ft minimum by ASTM D5262 test method.
 - 3. Long term allowable design load: 950 lbs/ft minimum by GRI GG-4 test method.
 - 4. Grid aperture size (MD): 0.8 inch (20 mm) minimum.
 - 5. Grid aperture size (CD): 1.28 inch (32 mm) maximum.
 - 6. Roll size: 6' width is preferred, up to 18'.
- B. Products meeting this specification:
 - 1. Stratagrid SG 150, by Strata, Cumming, GA, <http://www.geogrid.com>
 - 2. Miragrid 2XT as manufactured by Ten Cate Nicolon, Norcross, GA, <http://www.tencate.com> (Distributed by Geosynthetic Systems in Ontario)
 - 3. Fortrac 35 Geogrid as manufactured by Huesker, Charlotte, NC, <http://www.hueskerinc.com>
 - 4. SF 20 Biaxial Geogrid, as manufactured by Synteen, Lancaster, SC, <http://www.synteen.com>

2.7 GEOTEXTILE

- A. Geotextile shall be nonwoven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.
 - 1. Grab tensile strength: 200 lbs minimum (ASTM D 4632 test method).
 - 2. Elongation: 50% minimum (ASTM D 4632 test method).
 - 3. Trapezoid tear strength: 80 lbs minimum (ASTM D 4533 test method).
 - 4. Mullen burst strength: 350 psi minimum (ASTM D 3786 test method).
 - 5. Puncture strength: 110 lbs minimum (ASTM D 4833 test method).
 - 6. CBR puncture strength: 500 lbs minimum (ASTM D 6241 test method).
 - 7. Apparent opening size: 80 sieve maximum (ASTM D 4751 test method).
 - 8. Flow rate: 90 gal/min/ft² minimum (ASTM D 4491 test method).

9. UV Resistance (at 500 hours): 70% strength retained.

B. Products meeting this specification:

1. ADS Geosynthetics 0801T as manufactured by ADS Geosynthetics, <http://www.ads-pipe.com>
2. Mirafi 180 N as manufactured by Ten Cate Nicolon, Norcross, GA, <http://www.tencate.com>
 - a. In Canada, distributed by Geosynthetic Systems and Armtec (as Armtec 250)
3. Geotex 801 as manufactured by Propex Geosynthetics, Chattanooga, TN, <http://www.geotextile.com>
 - a. In Canada, distributed by Nilex (as Nilex 4553).

2.8 AGGREGATE SUB BASE (BELOW CELL FRAME)

A. Aggregate meeting one of the following specifications:

1. ASTM D1241-07, Type 1, Gradation B Standard Specification for Materials for Soil-Aggregate Sub base, Base, and Surface Courses.
 - a. Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve.

Sieve	Percent Passing
1.5" (37.5 mm)	100
1" (25 mm)	75-95
3/8" (9.5 mm)	40-75
No 4 (4.75 mm)	30-60
No 10 (2.0 mm)	20-45
No 40 (425 µm)	15-30
No 200 (75 µm)	5-15

2. Local Department of Transportation virgin aggregate that most closely meets the gradation of ASTM D1241-15.
3. Ontario Provincial Standard Specification (OPSS) 1010 Granular A.

Dense graded aggregates intended for use as granular base within the pavement structure, granular shouldering, and backfill.

Sieve	Percent Passing
26.5 mm	100
19.0 mm	85-100
13.2 mm	65-90
9.5 mm	50-73
4.75 mm	35-55

1.18 mm	15-40
300 µm	5-22
75 µm	2-8

2.9 AGGREGATE BASE COURSE (ABOVE CELL DECK)

- A. See Aggregate Sub Base.

2.10 AGGREGATE BASE COURSE FOR POROUS PAVEMENT (ABOVE CELL DECK)

- A. Aggregate meeting one of the following specifications:
 1. American Society for Testing and Materials (ASTM) D 448, No. 57

Sieve	Percent Passing
1.5" (37.5 mm)	100
1" (25mm)	95-100
1/2" (12.5 mm)	25-60
No 4 (4.75 mm)	0-10
No 8 (2.36 mm)	0-5

2.11 SETTING BED FOR UNIT PAVERS (ABOVE CELL DECK)

- A. Aggregate meeting one of the following specifications:
 1. American Society for Testing and Materials (ASTM) D 448, No. 8

Sieve	Percent Passing
1/2" (12.5 mm)	100
3/8" (9.5mm)	85-100
No 4 (4.75 mm)	10-30
No 8 (2.36 mm)	0-10
No 16 (1.18 mm)	0-5

2.12 BACKFILL MATERIAL (ADJACENT TO SILVA CELLS)

- A. Clean, compactable, coarse grained fill soil meeting the requirements of the Unified Soil Classification system for soil type GW, GP, GC with less than 30% fines, SW, and SC with less than 30% fines. Backfill material shall be free of organic material, trash and other debris, and shall be free of toxic material injurious to plant growth.
- B. Submit supplier certificate for material meeting this specification.

2.13 PLANTING SOIL

- A. See Specification Section 32 94 56 - Planting Soil for Silva Cells.

2.14 ROOT BARRIER

- A. Root Barrier shall be DeepRoot; Tree Root Barriers; UB 18-2, manufactured by DeepRoot Partners, L.P. (Deep Root); 530 Washington Street, San Francisco, CA 94111; 415.781.9700; 800.458.7668; fax 415.781.0191; www.deeproot.com.
- B. Material: Black, injection molded panels, 0.080" wall thickness in modules 24" long by 18" deep; manufactured with a minimum 50% post-consumer recycled polypropylene plastic with UV inhibitors; recyclable. Integrated zipper joining system providing for instant assembly by sliding one panel into another.

PART 3 - EXECUTION

3.1 LAYOUT APPROVAL

- A. Prior to the start of work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the Silva Cells and required drainage features in the correct locations.

3.2 EXCAVATION

- A. Excavate to the depths and shapes indicated on the drawings. Base of excavation shall be smooth soil, level and free of lumps or debris.
- B. Do not over-excavate existing soil beside or under the limits of excavation required for the installation. If soil is over-excavated, install compactable fill material in lifts not more than 8 inches deep and compact to the required density.
- C. Confirm that the depth of the excavation is accurate to accommodate the depths and thickness of materials required throughout the extent of the excavation.
- D. Confirm that the width and length of the excavation is a minimum of 6 inches, in all directions, beyond the edges of the Silva Cells.

3.3 SUBGRADE COMPACTION

- A. Check compaction of the subgrade below the Silva Cells and confirm that the subgrade soil is compacted to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method.
- B. Proof compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.
- C. Apply additional compaction forces at optimum water levels.

3.4 INSTALLATION OF GEOTEXTILE OVER SUBGRADE

- A. Where indicated on drawings, install geotextile over compacted subgrade.
- B. Removal of the geotextile as a standard component of the Silva Cell system must be determined by professional civil or geotechnical engineer.
- C. Install the geotextile with a minimum joint overlap of 18 inches between sections of material. Ensure geotextile is laid flat with no folds or creases.

3.5 INSTALLATION OF INSPECTION RISERS FOR DRAINAGE

- A. Cut PVC pipe to fit vertically from Silva Cell deck to finish surface.
- B. Manually perforate riser. Pipe should be rigid at level of pavement section, and perforated through level of Silva Cell system.
- C. Wrap pipe in geotextile and secure with zip ties. Brace riser for the remainder of installation to secure its location and elevation.
- D. Install caps on top of each riser flush with grade.

3.6 INSTALLATION OF AGGREGATE SUB BASE BELOW SILVA CELL FRAME

- A. Install aggregate sub base to the depths indicated on the drawings, under the first layer of Silva Cell frames. Sub base aggregate shall extend a minimum of 6 inches beyond the edge of the Cell frames.
- B. Compact aggregate sub base layer to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method. Compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.
- C. The maximum slope on the surface of the sub base shall be 5%. Where proposed grades on finished paving are greater than 5%, the Cells shall be stepped to maintain proper relationships to the finished grade.
- D. The grade and elevations of the base under the Silva Cells shall be approved by the landscape architect prior to proceeding with the installation of the Silva Cells.

3.7 INSTALLATION OF SILVA CELLS, PLANTING SOIL, GEOGRID, AND BACKFILL

- A. Identify the outline layout of the structure and the edges of paving around tree planting areas on the floor of the excavation, using spray paint or chalk line.
- B. Lay out the first layer of Silva Cell frames on the sub base. Verify that the layout is consistent with the required locations and dimensions of paving edges to be constructed over the Silva Cells.
- C. Check each Silva Cell frame unit for damage prior to placing in the excavation. Any cracked or chipped unit shall be rejected.
- D. Place frames no less than 1 inch and no more than 3 inches apart at base. In the event that spacing between Cells exceeds 3 inches, bridging slab details and methods shall be used to span these gaps.

- E. Install Silva Cell frames around, over, or under existing or proposed utility lines as indicated on plans.
- F. Where any two adjacent Silva Cell frames must be installed at different elevations, the upper frame shall be supported by aggregate sub base with a maximum slope of 1:1. This may require installation of aggregate sub base within the adjacent lower Cell frame. No two frames shall differ in elevation by more than 15 inches.
- G. Assure that each frame sits solidly on the surface of the sub base. Frames shall not rock or bend over any stone or other obstruction protruding above the surface of the sub base material. Frames shall not bend into dips in the sub base material. The maximum tolerance for deviations in the plane of the sub base material under the bottom of the horizontal beams of each Silva Cell frame shall be 1/4 inch in 4 feet.
- H. Adjust sub base material including larger pieces of aggregate under each frame to provide a solid base of support.
 - 1. Anchor each Silva Cell into sub base with four-10 inch spikes, driven through the molded holes in the Cell frame base. The purpose of the anchoring system is to maintain cell spacing and layout during the installation of planting soil and backfill.
 - 2. For applications where cells are installed over waterproofed structures, develop a spacing system consistent with requirements of the waterproofing system. Do not use anchoring nails that will come within 6" or less of any waterproofing material.
- I. Install the second layer of Silva Cell frames on top of the first layer. Comply with manufacturer's requirements to correctly register and connect the Cell frames together.
- J. Register each frame on top of the lower frame post. Rotate each frame registration arrow in the opposite direction from the frame below to assure that connector tabs firmly connect. Each frame shall be solidly seated on the one below.
- K. Build layers as stacks of frames set one directly over the other. Do not set any frame half on one Cell frame below and half on an adjacent frame.
- L. Install Strongbacks on top of the Silva Cell frames prior to installing planting soil and backfill.
 - 1. Strongbacks are required only during the installation and compaction of the planting soil and backfill.
 - 2. Strongbacks should be moved as the work progresses across the installation.
 - 3. Strongbacks shall be removed prior to the installation of Silva Cell decks.
- M. Install planting soil, geogrid and backfill as indicated on the drawings. The process of installation requires that these three materials be installed and compacted together in several alternating operations to achieve correct compaction relationships within the system.
- N. Where required, place the geogrid curtain along the outside of the limit of the Silva Cell frames.
 - 1. Geogrid curtains are required between the edge of the Silva Cells and any soils to be compacted to support paving beyond the area of Silva Cells. Do not place geogrid curtains between the edge of the Cells and any planting area adjacent to the Cells.
 - 2. Pre-cut the geogrid to allow for 6 inches minimum under lapping below backfill, and 12 inches minimum overlapping top of Silva Cell stack.
 - 3. Where Silva Cell layout causes a change direction in the plane of the geogrid, slice the top and bottom flaps of the material so that it lies flat on the top of the cell deck and aggregate base course along both planes.
 - 4. Provide a minimum of 12 inch overlaps between different sheets of geogrid.

5. Place the geogrid in the space between the Silva Cell frames and the sides of the excavation. Attach the geogrid to the Silva Cell frames using 3/16 inch x 14-inch zip ties. Attach with zip ties at every cell and at Cell Deck.
- O. Install no more than two layers of Silva Cell frames before beginning to install planting soil and backfill. Compact the planting soil within the Silva Cell frames and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both planting soil and backfill.
- P. Install and compact backfill material in the space between the Silva Cells and the sides of the excavation in lifts that do not exceed 8 inches.
 1. Compact backfill to 95% of maximum dry density using a powered mechanical compactor. Use a pneumatic compacting tool or narrow foot jumping jack compactor for spaces less than 12 inches wide and a 12-inch wide jumping jack compactor or larger equipment in wider spaces.
 2. Maintain the geogrid curtain between the Silva Cells frames and the backfill material.
 3. Install backfill in alternating lifts with the planting soil inside the Silva Cells.
- Q. Fill the first layer or layers of frames with planting soil, specified in Section 32 94 56 Planting Soil for Silva Cells.
 1. Bring planting soil to the site using equipment and methods that do not overly mix and further damage soil peds within the soil mix. Soil mixes shall not be blown or pumped into the Cells using soil blowing equipment.
 2. Install in lifts that do not exceed 16 inches. Lightly compact the soil inside the frames at each lift to remove air pockets and settle the soil within the frames.
 3. Do not compact greater than 80% of maximum dry density. Check the soil compaction with a penetrometer or densiometer to achieve similar compaction levels provided in the mock up.
 4. If the planting soil becomes overly compacted, remove the soil and reinstall. Use hand tools or other equipment that does not damage the Silva Cell frames.
 5. Do not walk directly on horizontal beams of the frames.
 6. Work soil under the horizontal frame beams of the second level of Cell frames and between columns eliminating air pockets and voids. Fill each frame such that there is a minimum of 10 inches of soil over the top of horizontal frame beams before beginning compaction.
 7. The top 1-2 inches of each frame post should remain exposed above the soil to allow the placement of the next frame or deck.
- R. After the first two layers of Silva Cell frames have been installed, filled with planting soil and backfilled, proceed to install the third layer, if required, of Silva Cells frames. Comply with manufacturer's requirements to correctly register and connect the Cell frames together.
- S. Remove the strongbacks. Sweep any soil from tops before adding the next layer of frames.
- T. Register each frame on top of the lower frame post. Rotate each frame registration arrow in the opposite direction from the frame below to assure that connector tabs firmly connect. Each frame shall be solidly seated on the one below.
- U. Build layers as stacks of frames set one directly over the other. Do not set any frame half on one Cell frame below and half on an adjacent frame.
- V. Install Strongbacks on top of third layer of Silva Cells.
- W. Continue to install and compact the planting soil within the Silva Cell frames and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both soils.

- X. The planting soil shall be brought to level not more than 1-inch below the bottom of the Silva Cell deck when installed.
 - Y. For porous pavement applications, a 3 inch layer of compost is recommended below the Silva Cell decks. When using compost, the final layer of planting soil as required to bring the planting soil level to not more than 3 inches below the bottom of the Silva Cell Deck when installed.
 - Z. Obtain final approval by the landscape architect of soil installation prior to installation of the Silva Cell deck.
 - AA. Remove Strongbacks after planting soil and backfill has been compacted to the top of the entire set of Silva Cells.
 - BB. Leave 1-inch air space, or install 3 inches of compost, below Silva Cell Deck as indicated on the drawings.
- 3.8 IRRIGATION AND WATER HARVESTING SYSTEM INSTALLATION
- A. Install irrigation per project specifications.
- 3.9 SILVA CELL DECK INSTALLATION
- A. Install the Silva Cell Decks over the top of each frame stack. Clean dirt from the tops of the Silva Cell frame columns. Register the deck and make connections as recommended by the manufacturer to secure the deck to the top of the Silva Cell Frame. Secure each deck at the four corners with screw fasteners as recommended by the manufacturer. Assure that each deck is seated firmly on the frame top with all connectors attached.
 - B. Install and compact remaining backfill material such that the soil outside the limits of the Silva Cells is flush with the top of the installed deck.
- 3.10 INSTALLATION OF GEOTEXTILE, GEOGRID, INSPECTION RISER FOR SOIL, AND AGGREGATE OVER THE DECK
- A. Overlap geogrid from the sides of the Silva Cells over the top of the Silva Cell Decks, with minimum of 12 inches overlap.
 - B. Place geotextile over the top of the deck and where indicated on the drawings, extending beyond the outside edge of the excavation by at least 18 inches. Any joints must be overlapped by a minimum of 18 inches.
 - C. Install inspection risers for soil above geotextile as indicated on drawings.
 - 1. Cut PVC pipe to fit vertically from Silva Cell deck to finish surface.
 - 2. Align riser with slots in Silva Cell deck.
 - 3. Wrap pipe in geotextile and secure with zip ties. Cut geotextile to overlap deck minimum 12".
 - 4. Cut geotextile inside the pipe to allow access. Do not cut or otherwise damage Silva Cell deck.
 - 5. Install caps on top of each riser flush with final paving surface.
 - D. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics and inspection risers. Work the aggregate from one side of the deck to the other to

assure that the fabric and aggregate conforms to the cell deck contours. Do not apply aggregate in several positions at the same time.

1. Aggregate base course shall be a minimum of 4 inches thick under pored in place concrete paving.
 2. Aggregate base course shall be a minimum of 12 inches thick under unit pavers, asphalt paving, or porous paving.
- E. Load the aggregate from equipment that is outside the limits of the excavated area. Work over material already in place.
- F. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the Silva Cell manufacturer.
- G. Compact aggregate base course(s) in lifts not to exceed 6" in depth, to 95% of maximum dry density. Utilize a roller or plate compactor with a maximum weight of 1000 pounds. Make sufficient passes with the compacting equipment to attain the required compaction.

3.11 INSTALLATION OF PAVING ABOVE THE SILVA CELL SYSTEM

- A. Place paving material over Silva Cell system per project specifications. Take care when placing paving or other backfill on top of Silva Cell system not to damage the system components.
- B. Turn down edge of all concrete paving to Cell deck along the edges of all planting areas to retain the aggregate base course.
- C. When paving is a unit paver or other flexible material, provide a concrete curb under the paving at the edge of the Silva Cell deck to retain the aggregate base course material.

3.12 INSTALLATION OF BRIDGING SLABS (WHERE APPLICABLE)

- A. Bridging slabs are to be used in locations where spacing larger than 3 inches is necessary between Silva Cell frames.
- B. Replace aggregate base course material with a minimum 4 inch concrete slab beneath paving. The paving shall extend beyond the gap between Cells at a minimum of 24 inches.
- C. If spacing (gap) between Cells is larger than 12 inches, the concrete slab must be increased to 6 inch thickness. If spacing (gap) between Cells is larger than 18 inches, steel reinforcing shall be added to the slab. Reinforcing is to be designed by the project structural engineer. In no case shall the space between Cells be greater than 30 inches.

3.13 INSTALLATION OF ROOT BARRIERS

- A. Install root barrier in accord with manufacturer's reviewed installation instructions.

3.14 INSTALLATION OF PLANTING SOIL WITHIN THE TREE PLANTING AREA

- A. Prior to planting trees, install additional planting soil, to the depths indicated, within the tree opening adjacent to paving supported by Silva Cells.
- B. Remove all rubble, debris, dust and silt from the top of the planting soil that may have accumulated after the initial installation of the planting soil within the Silva Cells.
- C. Assure that the planting soil under the tree root ball is compacted for the entire soil depth to 85-90% to prevent settlement of the root ball.
- D. The planting soil within the tree opening shall be the same soil as in the adjacent Silva Cells.
- E. Cover the planting soil finished grade with mulch as defined in Project specifications.

3.15 REPAIR OF CUT GEOTEXTILE

- A. In the event that any geotextile over subgrades or the Silva Cell decks must be cut during or after installation, repair the seam with a second piece of geotextile that overlaps the edges of the cut by a minimum of 12-inches in all directions prior to adding aggregate material.

3.16 PROTECTION

- A. Ensure that all construction traffic is kept away from the limits of the Silva Cells until the final surface materials are in place. No vehicles shall drive directly on the Silva Cell deck or aggregate base course.
- B. Provide fencing and other barriers to keep vehicles from entering into the area with Silva Cell supported pavement.
- C. Maintain a minimum of 4 inches of aggregate base course over the geotextile material during construction.
- D. When vehicle must cross Silva Cells that does not have final paving surfaces installed, use construction mats designed to distribute vehicle loads to levels that would be expected at the deck surface once final paving has been installed. Use only low impact track vehicles with a maximum surface pressure under the vehicle of 4 pounds per square inch, on top of the mats over Silva Cells prior to the installation of final paving.

3.17 CLEAN UP

- A. Perform cleanup during the installation of work and upon completion of the work. Maintain the site free of soil and sediment, free of trash and debris. Remove from site all excess soil materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

END OF SECTION

09/21/18

SECTION 32 94 55

EXTERIOR PLANTING SUPPORT STRUCTURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Welded wire grid panels.
 - 2. Panel channel and angle trim.
 - 3. Panel posts.
 - 4. Necessary clips, straps and spacers.
 - 5. Powdercoat finish.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 32 93 00, Planting; Furnishing and installing related plants.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog details for specified products demonstrating compliance with referenced standards. Provide list of fittings being provided with descriptions and either photographs or drawings for each type.
- B. Shop Drawings: Submit Shop Drawings for fabrication and installation. Include the following:
 - 1. Plans, elevations, and detail sections showing sizes, critical dimensions, panel layout constraints using a 2 x 2 inch modular grid, and details and locations of accessories.
 - 2. Indicate materials, methods, finishes, fittings, fasteners, anchorages, and accessory items.
- C. Verification Samples: Two samples representing actual products and finishes as follows:
 - 1. Welded wire grid panel, 6 in. x 6 in., with one edge of channel trim and one edge of angle trim, all as one unit.
 - 2. Color Submittals: Submit metal chips, 2 in. x 3-1/2 in. minimum, showing color and texture to be provided.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum 5 years experience in manufacturing and supplying welded wire panel systems of the type required for this Project.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect materials from damage. Store panels flat. Provide edge protection when strapping is used. Do not apply loads to panel edges.
- B. Inspect products upon delivery in order to submit timely freight claim for any damaged materials.
- C. Store products in manufacturer's packaging until ready for installation.
- D. Handle and store products according to manufacturer's recommendations. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.
- E. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.

1.7 PROJECT CONDITIONS

- A. Verify actual openings by field measurements before fabrication; show recorded measurements on shop drawings.
- B. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 - PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

- A. The welded wire panel plant support system and accessories shall have completed an ISO Compliant 14040/44, third party verified Life Cycle Assessment (LCA).

2.2 ACCEPTABLE MANUFACTURER

- A. **greenscreen®**, 1743 La Cienega Blvd., Los Angeles, CA 90035; Tel: 1-800-450-3494; Fax: 310-837-0523, www.greenscreen.com.

2.3 PANELS

- A. Panels shall be rigid, three dimensional welded wire grid fabricated of 14 gage galvanized steel wire.
 - 1. Metallic-Coated Steel Wire: Welded-wire, galvanized in accordance with ASTM A641.
- B. Face Grid: Wires shall be welded at each intersection to form a 2 x 2 inch face grid on the front and back of panels,

- C. Trusses: Face grids shall be separated by bent wire trusses spaced at 2-inch centers and welded to front and back face grids at each truss apex.
- D. Thickness: 3 inches.
- E. Length and Width: As indicated on the Drawings.
- F. Tolerance: 1/8 inch in width and 1/8 inch in length.

2.4 ACCESSORIES

- A. Trim:
 - 1. Fabricate from 20-gage ASTM A879 galvanized steel.
 - 2. Types:
 - a. Channel Trim: Thickness of panel x 1/2 inch legs.
 - b. Angle Trim: 1/2-inch x 1/2-inch legs.
 - 3. Locations:
 - a. As indicated on the Drawings.
- B. Clips and Straps: Provide manufacturer's standard types of clips and straps suitable for mounting conditions. Fabricate from ASTM A879 galvanized steel. Adjustable clips shall have 1/4-inch diameter 18-8 stainless steel bolt, washer, and nut.
- C. Plastic Spacers: Provide 1/2-inch thick black Ultra High Molecular Weight polyethylene (UHMW) washers to hold clips away from mounting surface.
- D. Fasteners for Attachment to Structure Pull Out Value:
 - 1. To Concrete or Masonry: [480 lbs.].
 - 2. To Structural Steel: [480 lbs.].
 - 3. To Light-Gage Steel Framing: [480 lbs.].

2.5 FABRICATION

- A. Cut to size.
- B. Weld trim to panels and grind smooth exterior surfaces of welds.
- C. Curved Panels: All curved panels shall be fabricated in the factory using approved "Cut-to-Curve" or "Crimped-to-Curve" procedures as recommended by manufacturer for diameter of curve and conditions of use prior to application of powder coat finish to ensure that all wire edges are coated and protected. The use of "Cut-to-Curve" or "Crimped-to-Curve" fabrication technique is dependent on the specific radius and the direction of the curve relative to the flat panel layout.

2.6 FINISH

- A. Metal components (except fasteners) shall receive commercial grade finish system after fabrication.

- B. Finish System:
 - 1. Pretreat with general purpose, alkaline, water based cleaner / degreaser applied at 240 degrees F.
 - 2. Prime with fusion bond epoxy powder coat.
 - 3. Topcoat with TGIC polyester or polyester-urethane powder coat with a minimum total dry film thickness of not less than 6 mils.
- C. Salt Spray Resistance: Finish shall remain rust free when tested 1680 hours in accordance with ASTM B117.
- D. Finish and Color: Color selected by Architect from manufacturer's standards.
- E. Touch-Up Paint: Provide high quality, exterior-grade spray paint suitable for conditions of use.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Verify alignment, support dimensions, and tolerances are correct.
- B. Inventory components to ensure all required items are available for installation. Inspect components for damage. Remove damaged components from site and replace.

3.3 INSTALLATION - GENERAL

- A. Spans: For freestanding fences and screens, span between structural supports should not exceed 8' for 3" thick panels without thorough review of specific site conditions and mounting details. For overhead horizontal or inclined panels span between structural supports should not exceed 4'. All curved panel spans should be reviewed based on specific panel radius and center-to-center of proposed structural support spacing.
- B. Install panels plumb and square, centered within area designated for panels, and aligned to maintain modular grid.
- C. Avoid cutting panels in field. Where field cutting is essential, clean and dry area and apply touch-up paint to cut edges.
- D. Install securely with fasteners located as shown on Drawings, and to meet manufacturer's requirements.

- E. Repair bent or damaged panels. If panels cannot be repaired to satisfaction of Architect, remove from jobsite and replace with new panels.

3.4 INSTALLATION

- A. Install welded wire panel plant support system according to manufacturer's written instructions.

3.5 ADJUSTING AND CLEANING

- A. Remove temporary coverings and protection of adjacent work areas. Clean installed products in accordance with manufacturer's instructions before Owner's acceptance.
- B. Do not use abrasive cleaners.
- C. Remove from project site and legally dispose of construction debris associated with this work.

3.6 PROTECTION

- A. Protect installed products until completion of Project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Protect installed products and finished surfaces from damage during construction.
- D. Replace defective or damaged components as directed by Architect.

3.7 PLANT INSTALLATION

- A. Refer to Section 32 93 00, Planting.

END OF SECTION

08/27/18

SECTION 32 94 56

PLANTING SOIL FOR SILVA CELLS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Furnishing and installation of Planting Soil within the Silva Cell system.
- B. Related Sections:
 - 1. Specification Section 32 93 00 - Planting.
 - 2. Specification Section 32 94 50 - Silva Cells.

1.3 DEFINITIONS

- A. Clay, silt, sand, and gravel soil particles: Per USDA size designations. It is critical NOT to use testing laboratories that report results in engineering size designations such as the Unified or AASHTO systems.
- B. Existing Site Soil:
 - 1. Existing site soil that is clean, coarse grained fill soil meeting the requirements of the Unified Soil Classification system for soil type GW, GP, GC with less than 40% fines, SW, and SC with less than 40% fines. Soil shall be sufficiently friable to be mixed with the required compost and installed into the Silva Cell system.
 - 2. Existing site soil shall be free of, trash and other debris. It shall be free of stones, stumps, roots, or other similar objects larger than three inches, and shall be free of toxic material injurious to plant growth.
- C. Planting Soil Mix: Soil, of a variety of textures, defined in this section, intended to fill the Silva Cell frames and other planting spaces to support the growth of trees and other plants. All planting soils within this specification shall be suitable for the germination of seeds and the support of vegetative growth.
- D. Screened Soil: Typical of stockpiled soils available direct from a soil supplier. Screening eliminates soil peds, and should be limited in the soil mixing process.
- E. Silva Cells: Plastic structural cellular system with post, beams and decks designed to be filled with planting soil for tree rooting and/or used for water storage and support vehicle loaded pavements.
- F. Soil Peds: Clumps of soil that naturally aggregate during the soil building process. Creating a soil mix shall be done in a way that maintains the soil peds. Refrain from over-mixing.
- G. Topsoil: Fertile, friable, loamy soil, harvested from natural topsoil sources; free from subsoil, refuse, roots, heavy or stiff clay, stones larger than 1 inch, contaminants,

noxious seeds, sticks, brush, litter, and other deleterious substances; suitable for the germination of seeds and the support of vegetative growth.

- H. Tree: A perennial woody plant with one or several trunks and a distinct crown and intended to become large enough to shade people and or vehicles.

1.4 PRECONSTRUCTION MEETING

- A. Prior to the start of the installation of Planting Soil within the Silva Cells, meet at the site with the landscape architect, general contractor and the Silva Cell installer to review installation layout, procedures, means and methods.

1.5 SUBMITTALS

- A. Upon forty-five (45) days prior to start of installation of items in this section, the Contractor shall provide submittals required in this section to the landscape architect for review and approval.
- B. Soil test analysis: Submit soil testing results from an approved soil-testing laboratory for each soil mix for approval.
1. All testing will be at the expense of the Contractor. The landscape architect may request additional planting mix tests on different mix component ratios in order to attain results that more closely meet the mix requirements.
 2. The testing laboratory shall be a member of the Soil Science Society of America's, North American Proficiency Testing Program (NAPT), and have a minimum of five years' experience with the test protocols of the United States Golf Association - Green Section.
 3. All testing shall comply with the requirements of the Methods of Soil Analysis Part 1 and 3, published by the Soil Science Society of America.
 4. Soil testing shall be required as defined below:
 - a. Physical analysis:
 - 1) USDA particle size analysis shall be provided for gravel, clay, silt, and sand fractions
 - 2) USDA soil texture.
 - 3) Fines Modulus Index for each sand source.
 - 4) Infiltration/Permeability/Hydraulic Conductivity testing shall be done using ASTM D 2434 or ASTM F1815 at 80% AND 85% compaction at proctor density (ASTM D 698-12e2).
 - a) This is a LABORATORY TEST to determine water flow at specified compaction rates.
 - b) Laboratories that provide this testing include:
 - i. Hummel Soil Labs, www.turfdoctor.com; (607) 387-5694, 35 King Street, PO Box 606, Trumansburg, NY, 14886.
 - ii. Turf Diagnostics & Design, www.turfdiag.com ; (913)-72-3700, 613 E. 1st Street, Linwood, KS, 66052.
 - b. Chemical analysis. Note that nutrient levels and chemical analysis shall include recommendations from the testing laboratory for ranges of each element appropriate for the types of plants to be grown in the soil mix.
 - 1) Nutrient levels by parts per million including phosphorus, potassium, calcium, magnesium, manganese, iron, copper, zinc and calcium.
 - 2) Percent organic content.
 - 3) pH.

- 4) Soluble salt by electrical conductivity.
- 5) Cation Exchange Capacity (CEC):
 - a) Chemical analysis shall be interpreted by project Landscape Architect based on plant material specified and testing recommendations.

- C. Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets the requirements of the specification.
- D. Material Certificates: Submit material certificates for all natural and bulk material indicating that the material meets the requirements of the specification.
- E. Samples for Verification: one gallon minimum per soil component or soil mix. Label samples to indicate product, source location, specification number, characteristics, and locations in the Work. Samples will be reviewed for appearance only. Compliance with all other requirements is the exclusive responsibility of the contractor. Delivered materials shall closely match the samples.
 - 1. Planting mix samples shall be labeled as to the percentage of each component.

1.6 SOIL INSTALLATION MOCK UP AND COMPACTION EVALUATION

- A. Prior to the installation of planting soil within the Silva Cells, construct a mock up of the complete installation at the site. The installation of the mock up shall be in the presence of the landscape architect.
- B. The Silva Cell mock up shall be as outlined in Specification Section 32 94 50 Silva Cells.

1.7 SCHEDULING

- A. General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- B. Schedule all utility installations prior to beginning work in this section.
- C. Where possible, schedule the installation of planting soil within the Silva Cells immediately after the installation of the Silva Cell frames. Protect installed Silva Cells from damage in the event that work must occur over or adjacent to the completed Silva Cells.

1.8 QUALITY ASSURANCE

- A. Qualifications: Soil within the Silva Cells shall be installed by the same contractor who is installing the Silva cells. See Specification Section 32 94 50 Silva Cells for installer qualifications.

1.9 PERMITS AND CODE COMPLIANCE

- A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary permits/approvals from all such authorities.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, if applicable. Protect materials from deterioration during delivery and while on the project site.
- B. Bulk Materials: Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.
 - 1. Bulk materials shall be stored and staged in a location approved by landscape architect or as indicated on the plans and in a manner that prevents damage to the site or the stored materials.
 - 2. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect the finish material
- C. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the project limits as needed.
- D. Protect Silva Cells from damage during installation of planting soil.

1.11 PROJECT CONDITIONS

- A. During the installation of Planting Soil within the Silva cells comply with all project conditions in Specification Section 32 94 50 Silva Cells.
- B. Weather Limitations: Do not proceed with work when subgrade, soils and planting soils are in a wet, muddy or frozen condition.

1.12 PROJECT WORK

- A. Coordinate installation with all other work that may impact the completion of the Silva Cell installation.

PART 2 - PRODUCTS

2.1 COARSE SAND

- A. Coarse sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
 - 1. Sands shall be clean, sharp, natural sands free of limestone, shale and slate particles.
 - 2. Sand pH shall be lower than 7.0
 - 3. Provide the following particle size distribution:

<u>Sieve size</u>	<u>% Passing</u>
3/8"	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	5-30
#100	4-10
#200	2-4

- B. Submittals shall be completed per Article 1.5 and shall be interpreted by project Landscape Architect based on plant material specified and testing recommendations.

2.2 COMPOST

- A. Compost shall meet the requirements of the US Composting Council "Landscape Architecture/Design Specifications for Compost Use", section "Compost as a Landscape Backfill Mix Component," with the following additional requirements:
1. Compost feedstock shall be yard waste trimmings and/or source-separated municipal solid waste to produce fungi-dominated compost. Compost shall not be derived from biosolids or industrial residuals.
- B. Compost testing and analysis: Compost analysis shall be provided by the Compost supplier. Before delivery of the Compost, the supplier must provide the following documentation:
1. A statement that the Compost meets federal and state health and safety regulations.
 2. Compost testing methodologies and sampling procedures shall be as provided in Test methods for the Examination of Composting and Compost (TMECC), as published by the US Composting Council.
- C. Submittals shall be completed per Section 1.5 and shall be interpreted by project Landscape Architect based on plant material specified and testing recommendations.

2.3 TOPSOIL

- A. Topsoil texture shall be a naturally produced soil of loam, sandy loam to sandy clay loam, within the following parameters, and suitable for the germination of seeds and the support of vegetative growth.
- B. Physical Parameters:
- | Parameter | Units | Acceptable Range |
|----------------|--------------|------------------|
| Gravel | % by volume | Less than 10% |
| Sand | % by volume | 30-70% |
| Silt | % by volume | 10-50% |
| Clay | % by volume | 10-25% |
| Organic Matter | % Dry Weight | 2-8% |
- C. Physical Parameters:
- | Parameter | Units | Acceptable Range |
|-----------|----------|------------------|
| pH | pH Units | 6.5-7.5 |
- D. Submittals shall be completed per Article 1.5 and shall be interpreted by project Landscape Architect based on plant material specified and testing recommendations.

2.4 FERTILIZER

- A. Local soil types and conditions may require supplemental nutrients. If noted by the soil testing facility, add slow-release, organic fertilizer based on plant requirements.
- B. Fertilizers should NOT be added in Bioretention applications.
- C. Submittals shall be completed per Article 1.5 and shall be interpreted by project Landscape Architect based on plant material specified and testing recommendations.

2.5 UNSCREENED SOIL MIX

- A. This soil is a mix of coarse sand, topsoil and compost to achieve the following parameters:

- B. Physical Parameters:

<u>Material</u>	<u>Units</u>	<u>Acceptable Range</u>
Coarse Sand	% by volume	35-50%
Compost	% by volume	12-17%
Topsoil	% by volume	35-50%

1. Adjust the ratio of the components to achieve infiltration rates between 2 and 3 inches per hour when compacted to 80-85% maximum dry density.

- D. Physical Parameters:

<u>Parameter</u>	<u>Units</u>	<u>Acceptable Range</u>
pH	pH Units	6.5-7.5

- E. Do not screen or over mix to maintain soil peds. Soil peds or clumps up to 4 inches in diameter are acceptable in the soil mix.
- F. Fertilizers, where indicated by soil test and approved by project Landscape Architect, shall be added during soil mixing.
- G. Once mixing is complete, cover stock piles with tarps or heavy plastic to protect soil from drying, saturation and erosion.
- H. Submittals shall be completed per Article 1.5 and shall be interpreted by project Landscape Architect based on plant material specified and testing recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install planting soil in Silva Cells as described in Section 32 95 40 Silva Cells.

END OF SECTION

03/12/19

SECTION 33 10 00

WATER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site domestic water and fire water systems serving all buildings and appurtenances. Unless otherwise noted, this section does not apply to irrigation water systems and water systems inside and within 5 feet of buildings. This section applies to:
 - 1. Domestic water distribution and services.
 - 2. Fire water distribution and services.
- B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.

1.02 SUBMITTALS

- A. Comply with requirements of Section 01 33 00 – SUBMITTALS.
- B. Product Data: Submit manufacturer's certification of Compliance for all materials used.
- C. Shop Drawings and Calculations: Where an on-site fire water system is required, Contractor shall provide shop drawings for engineer and agency approval prior to construction. Coordinate with the Contract Documents and identify any proposed modifications or deviations. Shop Drawings and Calculations shall be stamped and signed by a registered Fire Protection Engineer licensed by the State of California as required.
 - 1. Include the following information:
 - a. Design assumptions.
 - b. Thrust block sizing and calculations.
 - c. Materials to be used.
 - d. Available water pressure.
 - e. Required water pressure.
 - 2. The review of fire system components constitutes only a portion of the review and approval required. A copy of the fire system component submittal package shall be forwarded to the local fire marshal for further review and approval.
- D. Test Reports:
 - 1. Water Pressure Report: Contractor shall engage the public utility agency, or a qualified testing service to conduct a flow test of the existing water main(s). Provide date and location of test, type and method of test performed, static pressure and residual pressure in psig, observed flow in gpm, and orifice size.
- E. Samples: None specified. Provide as necessary.

1.03 QUALITY ASSURANCE

- A. Comply with the latest edition of the following Standards and Regulations:

1. American Water Works Association (AWWA) and American National Standards Institute (ANSI):
 - a. C104/A21.4 ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - b. C105/A21.5 ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110/A21.10 ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 inch - 48 inch for Water.
 - d. C111/A21.11 ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - e. C115/A21.15 ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - f. C116/A21.16 ANSI Standard for Protective Fusion-Bonded Epoxy Coatings Interior & Exterior Surfaces for Ductile-Iron and Gray-Iron Fittings.
 - g. C150/A21.50 ANSI Standard for Thickness Design of Ductile-Iron Pipe.
 - h. C151/A21.51 ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - i. C153/A21.53 ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
 - j. C500 Metal-Seated Gate Valves for Water Supply Service.
 - k. C502 Dry-Barrel Fire Hydrants.
 - l. C503 Wet-Barrel Fire Hydrants.
 - m. C504 Rubber-Seated Butterfly Valves.
 - n. C507 Ball Valves, 6 inches - 48 inches.
 - o. C508 Swing-Check Valves for Waterworks Service, 2 inches - 24 inches NPS.
 - p. C509 Resilient-Seated Gate Valves for Water Supply Service.
 - q. C510 Double Check Valve Backflow Prevention Assembly.
 - r. C511 Reduced-Pressure Principle Backflow Prevention Assembly.
 - s. C512 Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
 - t. C550 Protective Epoxy Interior Coating for valves and Hydrants.
 - u. C600 Installation of Ductile-Iron Water Mains and their Appurtenances.
 - v. C602 Cement- Mortar Lining of water Pipelines in place- 4 inches and larger.
 - w. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
 - x. C651 Disinfecting Water Mains
 - y. C652 Disinfection of Water-Storage Facilities
 - z. C800 Underground Service Line Valves and Fittings for 1/2 inches - 2 inches.
 - aa. C900 Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inches - 12 inches, for Water Distribution.
 - bb. C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 inches, for Water Service.
 - cc. C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inches - 48 inches.
 - dd. C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inches - 63 inches, for Water Distribution and Transmission.
 - ee. C907 Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 inches - 8 inches.
 - ff. C908 PVC Self-Tapping Saddle Tees for Use on PVC Pipe.
 - gg. D103 Factory-Coated Bolted steel Tanks for water Storage.
2. National Fire Protection Association (NFPA):
 - a. NFPA 13 Standard for the Installation of Sprinkler Systems.
 - b. NFPA 14 Standard for the Installation of Standpipe, Private Hydrants, and Hose Systems.

- c. NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection.
 - d. NFPA 22 Standard for Water Tanks for Private Fire Protection.
 - e. NFPA 24 Private Service Mains and their Appurtenances.
 - f. NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
3. Uni-Bell Plastic Pipe Association (UNI):
- a. PUB 3 PVC Pipe – Technology Serving the Water Industry.
 - b. PUB 7 External Corrosion of Underground Water Distribution Piping Systems.
 - c. PUB 8 Tapping Guide for AWWA C900 Pressure Pipe.
 - d. PUB 9 Installation Guide for PVC Pressure Pipe.
 - e. B-8 Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 inch).
4. American Society of Testing and Materials (ASTM International):
- a. ASTM A536 Standard Specification for Ductile Iron Castings.
 - b. ASTM A674 Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
 - c. ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - d. ASTM D2241 Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe.
 - e. ASTM D2466 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - f. ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
 - g. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
 - h. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 - i. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - j. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - k. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - l. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
 - m. ASTM F1056 Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.
 - n. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - o. ASTM A795 Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
 - p. ASTM A865 Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
 - q. ASTM B88 Standard Specification for Seamless Copper Water Tube.
5. American Society of Mechanical Engineers (ASME):
- a. ASME B16 series for valves, fittings, flanges, and gaskets applicable for use in water systems.
 - b. ASME B1.20.1 American Standard Tapered Pipe Threads for factory-threaded pipe and pipe fittings.
6. National Sanitation Foundation (NSF):
- a. NSF/ANSI 14 Plastics Piping System Components and Related Materials.
 - b. NSF/ANSI 61 Standard for Drinking Water Systems Components –

- Health Effects.
7. Underwriters Laboratories, Inc. (UL):
 - a. UL 157 Standard for Safety for Gaskets and Seals.
 - b. UL 194 Standard for Safety for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service.
 - c. UL 213 Rubber Gasketed Fittings for Fire-Protection Service.
 - d. UL 246 Standard for Safety for Hydrants for Fire-Protection Service.
 - e. UL 262 Standard for Safety for Gate Valves for Fire-Protection Service.
 - f. UL 312 Standard for Safety for Check Valves for Fire-Protection Service.
 - g. UL 405 Standard for Safety for Fire Department Connections.
 - h. UL 448 Standard for Safety for Pumps for Fire-Protection Service.
 - i. UL 789 Standard for Safety for Indicator Posts for Fire-Protection Service.
 - j. UL 860 Pipe Unions for Flammable and Combustible Fluids and Fire-Protection Service.
 - k. UL 1091 Standard for Safety for Butterfly Valves for Fire-Protection Service.
 - l. UL 1285 Pipe and Couplings, Polyvinyl Chloride (PVC), for Underground Fire Service.
 - m. UL 1468 Direct Acting Pressure Reducing and Pressure Restricting Valves.
 - n. UL 1478 Standard for Safety for Fire Pump Relief Valves.
 8. FM Global (FM):
 - a. FM 1020 Automatic Water Control Valves.
 - b. FM 1045 Waterflow Detector Check Valves.
 - c. FM 1110 Indicator Posts.
 - d. FM 1111 Post-Indicator-Valve-Assembly.
 - e. FM 1112 Indicating Butterfly Valves.
 - f. FM 1120 and FM 1130 Fire Service Water Control Valves (OS&Y and NRS Type Gate Valves).
 - g. FM 1210 Swing Check Valves.
 - h. FM 1221 Backflow Preventers (Reduced Pressure Principle and Double Check Valve Types).
 - i. FM 1311 Centrifugal Fire Pumps (Horizontal, Split-Case Type).
 - j. FM 1312 Centrifugal Fire Pumps (Vertical-Shaft, Turbine Type).
 - k. FM 1319 Centrifugal Fire Pumps (Horizontal, End Suction Type).
 - l. FM 1361 Water Pressure Relief Valve.
 - m. FM 1362 Pressure Reducing Valves.
 - n. FM 1371 Centrifugal Fire Pumps (In-Line Type).
 - o. FM 1510 Fire Hydrants (Dry Barrel Type) for Private Fire Service.
 - p. FM 1511 Fire Hydrants (Wet Barrel Type) for Private Fire Service.
 - q. FM 1530 Fire Department Connections.
 - r. FM 1610 Plastic Pipe & Fittings for Underground Fire Protection Service.
 - s. FM 1620 Pipe Joints & Anchor Fittings for Underground Fire Service Mains.
 9. Plastics Pipe Institute (PPI):
 - a. Underground Installation of Polyethylene Pipe.
 - b. Polyethylene Joining Procedures.
 - c. Inspections, Test and Safety Considerations.
 10. American Association of State Highway and Transportation Officials (AASHTO) for H₂O Loading.
 11. American Concrete Institute (ACI).
 - a. ACI 348 - Meter Pit Construction.
 12. Local Standard Specifications and Details.
 13. Local Fire Department Regulations.
 14. Other authorities having jurisdiction.

- B. System Description: Grades and elevations are to be established with benchmarks referenced on Plans.
- C. Comply with County of San Mateo Standards and authorities having jurisdiction for the installation and testing of potable water piping and fire protection systems.
- D. All testing of systems specified in this section shall be witnessed by representatives of the local water department or local authority. Provide at least 7 days notice.
- E. The Contractor shall prepare shop drawings and calculations, and obtain all required approvals for the fire water system of the proposed project. Contractor shall have shop drawings and calculations stamped and signed by a fire protection engineer, licensed by the State of California, as required by the County of Marin.

PART 2 - PRODUCTS

2.01 PIPING

- A. Water Distribution Main (pipe size 4 inches and larger).
 - 1. Ductile Iron Pipe (DIP): Pressure Class 350 pipe conforming to AWWA/ANSI C151/A21.5, cement-mortar lining conforming to AWWA/ANSI C104/A21.4, with standard thickness per AWWA/ANSI C150/A21.50. U.S. Pipe, American Cast Iron Pipe Company (ACIPCO), or approved equivalent.
 - a. Flanged ends shall conform to AWWA/ANSI C115/A21.15.
 - b. Rubber-gasket joints shall conform to AWWA/ANSI C111/A21.11.
 - 2. Polyvinyl Chloride Pipe (PVC): Pressure Class 200, DR 14, spigot and gasket bell end, conforming to AWWA C900 or AWWA C905, with equivalent cast-iron pipe outer diameter (O.D.). J-M Manufacturing, PW Pipe, North American Pipe Company, or approved equivalent.
 - 3. Polyethylene Pipe (PE): PE 3408, Pressure Class 200, DR 9, conforming to AWWA C906. Driscopipe 4000/4100, or approved equivalent.
- B. Water Service Line (pipe size 3 inches and smaller)
 - 1. Copper (Cu): Provide Type K soft or hard copper pipe conforming to ASTM B88.
 - 2. For pipe size 1 inches and smaller High Density Polyethylene Pipe (HDPE): PE3408, Pressure Class 200, DR 9 conforming to AWWA C901. PWPIPE or approved equivalent.

2.02 FITTINGS, GASKETS, COUPLINGS, SLEEVES, AND ASSEMBLY BOLTS AND NUTS

- A. For DIP: Provide fittings with pressure rating greater than or equal to that of the pipe. Provide flanged joints, mechanical joints, push-on joints, and insulating joints where indicated. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated. Provide ends of pipe and fittings suitable for the specified joints. Fittings shall have cement-mortar lining conforming to AWWA/ANSI C104/A21.4.
 - 1. Flanged Joints: Provide bolts, nuts, and gaskets in conformance with AWWA/ANSI C115/A21.15. Flanged fittings shall conform to AWWA/ANSI C110/A21.10 or C153/A21.53.
 - a. Provide flange for set screwed flanges of ductile iron, ASTM A536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250.

- b. Provide setscrews for set screwed flanges of 190,000 psi tensile strength, heat treated and zinc-coated steel.
 - c. Gaskets for set screwed flanges shall conform to the applicable requirements for mechanical-joint gaskets specified in AWWA/ANSI C111/A21.11.
 - d. Design of set screwed gaskets shall provide for confinement and compression of gasket when joint to adjoining flange is made.
 - e. Unless otherwise required, above ground flange assembly bolts shall be standard hex-head, cadmium plated machine bolts with American Standard Heavy, hot-pressed, cadmium plated hexagonal nuts. Buried flange nuts and bolts shall be as above except they shall be of Type 304 stainless steel.
 - 2. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
 - 3. Push-on Joints: Provide shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly conforming to AWWA/ANSI C111/A21.11. Modify bell design fittings, as approved.
 - 4. Insulating Joints: Provide a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact at the joint between adjacent sections of dissimilar metals.
 - a. Provide joint of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers.
 - b. Provide gasket of the dielectric type, full face, as recommended in AWWA/ANSI C115/A21.15.
 - c. Provide bolts and nuts as recommended in AWWA/ANSI C115/A21.15.
- B. For PVC: Fittings shall be DIP or PVC.
- 1. DIP fittings: Provide gray-iron or ductile-iron conforming to AWWA/ANSI C110/A21.10, with cement-mortar lining conforming to AWWA/ANSI C104/A21.4, and standard thickness, with equivalent cast-iron pipe O.D.
 - a. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except the bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe.
 - b. Provide push-on joints, compression joints and mechanical joints where indicated between pipe and fittings, valves, and other accessories.
 - c. Mechanical joints, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
 - 2. PVC fittings: Provide fabricated PVC fittings for pressure pipe conforming to AWWA C900, C905, or C907.
 - a. PVC fittings shall conform to ASTM D2466.
 - b. Push-on joints shall conform to ASTM D3139.
 - c. Compression joints shall conform to ASTM D3139.
 - d. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets shall conform to ASTM F477.
- C. For PE: Fittings shall conform to AWWA C901 or AWWA C906. Driscopipe, or approved equivalent.
- 1. Socket type fittings shall conform to ASTM D2683.
 - 2. Butt fusion fittings shall conform to ASTM D3261.
 - 3. Electrofusion fittings shall comply with ASTM F1055.
- D. For Cu:
- 1. Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18.

2. Wrought copper solder-joint pressure fittings or wrought copper alloy unions shall conform to ASME B16.22
3. Cast copper alloy flare fittings shall conform to ASME B16.26.
4. Wrought copper alloy body, hexagonal stock, metal-to-metal seating surfaces, and solder-joint threaded ends shall conform to ASME B1.20.1.
5. Compression connections shall be Mueller 110, Ford or approved equivalent.

E. For HDPE:

1. Cast Copper Fittings shall conform to ASME B16.18.
2. Cast Copper Compression Fittings and connections shall be Mueller 110 Ford or approved equivalent.

2.03 GATE VALVES AND BALL VALVES

A. Gate Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.

1. Stuffing boxes shall have O-ring stem seals. Provide stuffing boxes bolted and constructed so as to permit easy removal of parts for repair.
2. Valves (2-1/2 inches and larger):
 - a. Provide valves conforming to AWWA C500 or AWWA C509 and of one manufacturer. Valves shall have a non-rising stem, a 2-inch square nut, and double-disc gates. Valves shall be rated for 250 psi maximum working pressure. Mueller 2360 series, ACIPCO, or approved equivalent.
 - b. For the domestic water system, valves shall also conform to ANSI/NSF 61.
 - c. For the fire water system, valves 2 inches through 16 inches in size shall also conform to UL 262 and FM 1120 or FM 1130 to a working pressure of 200 psi.
3. Where a post indicator is shown, provide valve with an indicator post flange.

B. Ball Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.

1. Valves (2-inches and smaller):
 - a. Provide valves conforming to AWWA C800 and of one manufacturer. Mueller 300 Series, Ford, or approved equivalent.
2. Provide valve with operating nut or handle as shown on the Construction Documents.

2.04 BLOW-OFF VALVES, AIR RELEASE AND VACUUM VALVES, AND COMBINATION AIR VALVES

A. Blow-off valves: Provide valve and service size as shown in the Contract Documents. Provide 2-inch valves at low points of the piping system, and 4-inch valves at dead-ends of the piping system, unless otherwise directed by the Engineer.

1. 2-inch blow-off shall have a 2-inch vertical female iron pipe (FIP) inlet and a 2-inch normal pressure and temperature (NPT) nozzle outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF550, or approved equivalent.
2. 4-inch blow-off shall have a 4-inch vertical FIP inlet and a 4-inch male iron pipe (MIP) outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF800, or approved equivalent.

- B. Air release and vacuum valves: Provide valve and service size as shown on the Contract Documents, and where there is an increase in the downward slope or a decrease in the upward slope of the piping system. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin Model UL, Apco, or approved equivalent.
- C. Combination air valves: Provide valve and service size as shown on the Contract Documents, and at high points and sharp changes in gradient of the pipe system. Valve shall have cast-iron single valve or double valve body, and shall conform to AWWA C512. A simple or compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Crispin Model C, Apco, or approved equivalent.

2.05 CHECK VALVES

- A. Check Valves: Valves shall have clear port opening and a cast-iron body. Provide spring-loaded or weight-loaded valves where indicated on the Construction Documents.
 - 1. For the domestic water system, provide swing-check type valves conforming to AWWA C508. Provide valves of one manufacturer. Mueller, Apco, or approved equivalent.
 - 2. For the fire water system, provide swing-check type valves conforming to FM 1210 and UL 312. Mueller, Watts, or approved equivalent.

2.06 PRESSURE REDUCING VALVES

- A. Pressure Reducing Valves: Valves shall have a cast-iron body, conforming to ASTM A536, with epoxy interior coating conforming to AWWA, and rated to pressure class .300. Cla-Val Model 90-01, Singer, or approved equivalent.
 - 1. Valves shall have flanged ends.
 - 2. Valves sized 3-inches or smaller may have screwed ends.

2.07 POST INDICATORS

- A. Posts Indicators shall withstand up to 900 ft-lbs of operating torque, be free-standing, and tamper-proof.
- B. Post Indicators shall conform to UL 789 and FM 1110. Mueller, ACIPCO, or approved equivalent.

2.08 VALVE BOXES, METER BOXES, FRAMES AND COVERS

- A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel or cast iron traffic cover marked "WATER". Christy Model G5 with G5C cover or approved equivalent.
- B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Contract Documents. Provide a precast concrete utility box for each buried appurtenance. Provide a traffic-rated lid for H20 loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equivalent.

2.09 BACKFLOW PREVENTERS

- A. Provide backflow preventers as shown on the Contract Documents. Subject to local water department approval. Backflow preventers on the fire water system shall be subject to approval by the local office of the fire marshal.
- B. Reduced Pressure Principle Assemblies (RPPA): Provide a cast-iron body RPPA consisting of two independently operating check valves with a pressure differential relief valve located between the two check valves, two shut-off valves and four test cocks. RPPA shall be tamper-proof and conform to AWWA C511. Febco 860, Watts, or approved equivalent.
- C. Double Check Detector Assemblies (DCDA): Provide a cast-iron body DCDA consisting of mainline double check assemblies in parallel with a bypass double check and meter assembly, two shut-off valves and four test cocks. DCDA shall be tamper-proof and conform to AWWA C510. Febco 806, Watts, or approved equivalent.

2.10 FIRE DEPARTMENT CONNECTIONS AND WET STAND PIPES

- A. Fire Department Connections (FDC): Provide FDC's with 2-1/2 inch female hose connections, sidewalk or free-standing type. Number of inlets shall be as shown on the Contract Documents. Clapper and spring check inlets shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Outlet shall be sized for simultaneous use of all inlets. Connection shall be branded "AUTO SPKR".
 - 1. 2-Way FDC: Connection shall conform to UL 405 or FM 1530. Elkhart, Croker, or approved equivalent.
 - 2. 3-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Elkhart, Croker, Potter-Roemer or approved equivalent.
 - 3. 4-Way FDC: Connection shall conform to UL 405. Potter-Roemer, Croker, or approved equivalent.
 - 4. 6-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Croker, Potter-Roemer or approved equivalent.
- B. Wet Stand Pipes (WSP): Provide 2-Way WSP's with valves and two (2) 2-1/2 inch male hose connections free-standing type, with a 4" inlet. Each outlet shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Water to the WSP shall be controlled with a remote valve. Connection shall be branded "HYDRANT". Subject to approval by the local water department or fire marshal. Croker, Elkhart, Potter-Roemer or approved equivalent.

2.11 FIRE HYDRANTS

- A. Provide two 2-1/2 inch and one 4-1/2 inch outlets, with a 6-inch nominal inside diameter inlet and break-away type bolts. Hydrant shall have a working pressure of 250 psi and shall conform to AWWA C502 or C503, and be UL listed and FM approved. Provide hydrants of one manufacturer. Clow 800 series, Mueller, ACIPCO, or approved equivalent, subject to approval by the local water department and fire marshal.

2.12 THRUST BLOCKS AND PIPE RESTRAINTS

- A. Thrust Blocks: Provide thrust blocks in accordance with NFPA 24 Standards. Use concrete conforming to ASTM C94 having a minimum compressive strength of 2,500 psi

at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

- B. Pipe Restraints: Provide thrust restraint systems for fittings and joints as required or as indicated on the Plans.
 - 1. For mechanical joint fittings and joints: Pipe restraints shall be "Mega-Lug" pipe restraint system by EBBA Iron, Inc., or approved equivalent.
 - 2. For push-on joint fittings and joints: Pipe restraints shall be "Field-Lok" gaskets by U.S. Pipe, or approved equivalent.
- C. Thrust blocks, gravity blocks, or mechanical pipe restraints may be used at Contractor's option, unless otherwise indicated on the Plans.
- D. Provide thrust blocks or mechanical pipe restraints at all fittings and changes in angle, alignment or elevation.
- E. Where depth or location of water piping, existing utilities, or other structures prohibit the use of standard thrust blocks, gravity blocks or mechanical pipe restraints may be used. Conform to NFPA 24 Standards.

2.13 TAPPING SLEEVES AND TAPPING VALVES

- A. Tapping sleeves shall be epoxy coated and furnished with stainless steel washers, nuts and bolts. Mueller H-615 and H-619, Ford, or approved equivalent.
- B. Tapping valves shall have flanged inlet, Class 125, conforming to ASME B16.1 and furnished with stainless steel washers, nuts and bolts. Tapping valves shall be constructed with a mechanical joint outlet. Mueller T-687, T-642, T-681, or approved equivalent.

2.14 SERVICE SADDLES AND CORPORATION STOPS

- A. Service Saddles shall conform to AWWA C800 and NSF 61.
 - 1. For DIP: Provide bronze or stainless steel body, double strap type with a 200 psi maximum working pressure. Mueller BR2 Series, Ford, or approved equivalent.
 - 2. For PVC: Provide bronze body, wide strap type. Mueller H-13000 Series, Ford, or approved equivalent.
 - 3. For PE:
- B. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi. and suitable for the working pressure of the system.
 - 1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
 - 2. Threaded ends shall conform to AWWA C800.
 - 3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
 - 4. Mueller H-15000 Series with "CC" threads and a copper flare straight connection outlet, Ford, or approved equivalent.

2.15 IDENTIFICATION MATERIALS AND DEVICES

- A. Marker Tape: Provide marker tape consisting of metallic foil bonded to plastic film not less than 2-inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1-mil. thick. The tape shall be identified with lettering, not less than 3/4-inch high, "CAUTION: WATER MAIN BELOW", repeated at approximately 24-inch intervals.
- B. Tracer Wire for Nonmetallic Piping: Provide 12 gage, coated copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

2.16 CORROSION PROTECTION

- A. In soils with high resistivity, high sulfides, high/low ph, redox potential and/or poor surrounding drainage conditions, or as indicated in the Contract Documents, encase underground pipe and appurtenances in 4-mil, high-density cross-laminated (HDCL) polyethylene film or 8-mil linear low-density (LLD) polyethylene film in accordance with AWWA/ANSI C105/A21.5. U.S. Pipe, ACIPCO, or approved equivalent.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where water service is being installed.
- B. Do not begin installation until unsatisfactory conditions have been corrected.

3.02 LOCATION OF WATER LINES

- A. Where the location of the water line is not clearly defined by dimensions on the Plans, do not lay water line closer than 10 feet horizontally from any sewer line.
- B. Where water lines cross under gravity sewer lines, encase sewer line in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing.
- C. Where water lines cross sewer force mains and inverted siphons, install water line at least 2 feet above these sewer lines.
- D. When joints in the sewer line are closer than 3 feet horizontally from the water line, encase sewer line joints in concrete.
- E. Do not lay water lines in the same trench with other utilities.
- F. Install water lines at 3'-0" minimum depth or as detailed on Plans.

3.03 INSTALLATION OF PIPING

- A. Inspection:
 - 1. Before placing in position, inspect pipe for noticeable defects. Clean the pipe, fittings, valves, and accessories, and maintain in a clean condition.
 - 2. Remove fins and burrs from pipe and fittings.

B. Pipe laying and jointing:

1. Provide proper facilities for lowering sections of pipe into trenches.
2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.
5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
6. Support pipe at proper elevation and grade.
7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown in the Contract Documents.

C. Installation of Tracer Wire:

1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

D. Connections to Existing Lines:

1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.

E. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads to keep out debris and contamination.

3.04. INSTALLATION OF DUCTILE-IRON PIPING

A. Install pipe and fittings in accordance with requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

B. Jointing:

1. Provide push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
2. Provide mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of AWWA C111.
3. Provide flanged joints with the gaskets, bolts, and nuts specified for this type

joint.

- a. Install flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
 - b. Align bolt holes for each flanged joint.
 - c. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
 - d. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without over straining the flange.
 - e. Where flanged pipe and fitting have dimensions that do not allow the installation of a proper flanged joint as specified, replace it by one of proper dimensions.
 - f. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the setscrewed flange manufacturer.
3. Provide insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints. Bolts for insulating sleeves shall be full size for the bolt holes.
 4. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- C. Exterior Protection: Completely encase buried ductile iron pipelines and underground appurtenances with polyethylene wrap. Install 8-mil linear low-density polyethylene (LLD) film or 4-mil high-density cross-laminated (HDCL) film per manufacturer's recommendations and in accordance with AWWA/ANSI C105/A21.5 and ASTM A674.
- D. Pipe Anchorage:
1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.
 2. Pipe anchorage shall be in accordance with NFPA 24 Standards.

3.05 INSTALLATION OF POLYVINYL CHLORIDE PIPING

- A. Install pipe and fittings in accordance with the requirements of UNI B-3 for the following:
1. The laying of pipe, joining PVC pipe to fittings and accessories.
 2. The setting of hydrants, valves, and fittings.
- B. Comply with the recommendations for pipe joint assembly and appurtenance installation in AWWA Manual M23, Chapter 7, "Installation".
- C. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.
- D. Jointing:
1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
 2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
 3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
 4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
 5. Assemble push-on joints for connection to fittings, valves, and other accessories

in accordance with the requirements of UNI B-3 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly.

6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

E. Pipe Anchorage:

1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.
2. Anchorage shall be in accordance with the requirements of UNI B-3 and in accordance with NFPA 24 Standards for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks shall be as indicated on the Construction Documents.

3.06 INSTALLATION OF POLYETHYLENE PIPING

- A. Install pipe, fittings, and appurtenances in accordance with PPI and Manufacturer's Recommendations.

B. Jointing:

1. Provide mechanical joints, compression fittings, or flanges as recommended by the manufacturer.
2. Jointing shall be performed using proper equipment and machinery by trained and certified personnel.
3. Joints, fittings and tools shall be clean and free of burrs, oil, and dirt.
4. Butt fusion:
 - a. Pipe ends shall be faced to establish clean, parallel mating surfaces.
 - b. Align and securely fasten the components to be joined squarely between the jaws of the joining machine.
 - c. Heat the ends of the pipe to the pipe manufacturer's recommended temperature interface pressure and time duration. A pyrometer or other surface temperature measuring device should be used to insure proper temperature of the heating tool. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
 - d. Prevent molten plastic from sticking to the heater faces. Molten plastic on the heater faces shall be removed immediately according to the tool manufacturer's instructions.
 - e. Bring the molten ends together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. Hold the molten joint under pressure until cooled adequately to develop strength. Refer to the Manufacturer's recommendations for temperature, pressure, holding, and cooling times.
 - f. Remove the inside bead from the fusion process using Manufacturer's recommended procedure.
5. Socket fusion:
 - a. Mixing manufacturers' heating tools and depth gages will not be allowed unless the tools conform to ASTM F1056.
 - b. Pipe ends shall be faced square to establish clean, parallel mating surfaces.
 - c. Clamp the cold ring on the pipe at the proper position using a depth

- gauge.
- d. Heat the tool to the pipe manufacturer's recommended temperature. A pyrometer or other surface temperature measuring device should be used to insure proper temperature. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
- e. Follow manufacturer's recommendations for bringing the hot tool faces into contact with the outside surface of the end of the pipe and the inside surface of the socket fitting.
- f. Simultaneously remove the pipe and fitting from the tool.
- g. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion.
- h. Hold or block the pipe in place during cooling.
- 6. Electrofusion:
 - a. Unless the operation is for a saddle-type electrofusion joint, pipe ends shall be faced square to establish clean, parallel mating surfaces.
 - b. Clamp the pipe and fitting at the proper position in the fixture.
 - c. Connect the electrofusion control box to the fitting and to the power source. Apply the electric current using manufacturer's instructions.
 - d. Allow the joint to cool before removing the clamping fixtures.

3.07 INSTALLATION OF VALVES

- A. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.
- B. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.
- C. Install gate valves on PVC water mains in addition in accordance with the recommendations for appurtenance installation in AWWA Manual M23, Chapter 7, "Installation."
- D. Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.
- E. Provide and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

3.08 INSTALLATION OF VALVE AND METER BOXES

- A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown in the Construction Documents. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxes shall be excavated, plumbed, and backfilled at no additional cost to the Owner.

3.09 INSTALLATION OF HYDRANTS

- A. Install hydrants, except for metal harness, plumbed vertical, in accordance with AWWA C600 for hydrant installation and as indicated.

- B. Provide and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Hydrants shall be set so that mounting bolts clear the top of finished grade by three inches so bolts may be easily replace if needed.
- C. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached.

3.10 SERVICE LINE CONNECTIONS TO WATER MAINS

- A. Connect service lines of size shown on plans to the main with a rigid connection or a corporation stop and gooseneck. Install a gate valve on the service line.
- B. Connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.
- C. Connect service lines to PVC plastic water mains in accordance with UNI-B-8 and the recommendations of AWWA Manual M231, Chapter 9, "Service Connections."

3.11 INSTALLATION OF BACKFLOW PREVENTERS

- A. Backflow devices shall be installed horizontal and level, with three feet minimum clearances from obstructions.

3.12 HYDROSTATIC PIPELINE TESTING

- A. Requirements:
 - 1. After the pipe has been laid and backfilled, perform hydrostatic pressure tests.
 - 2. Do not conduct tests until at least 12 hours have elapsed since pipe laying and at least 5 days have elapsed since placing of concrete thrust blocks.
 - 3. Fill the pipe with water which shall remain without external application of pressure for 24 hours before tests are conducted.
 - 4. Prior to hydrostatic testing, flush pipe system with fresh water until piping is free of dirt and foreign matter.
 - 5. Apply pressure by a pump and measured by a test gage. All necessary apparatus and labor for conducting the pressure and leakage tests shall be furnished by the Contractor.
 - 6. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
 - 7. For pressure test, use a hydrostatic pressure not less than 200 psi. The duration of the test shall not be less than 4 hours with the variation in pressure of not more than 5 psi for the duration of the test.
- B. Leakage Tests:
 - 1. Perform tests at the same time as pressure tests.
 - 2. Leakage rate shall be measured for at least 4 hours with a certified water meter, or other approved method. If requested, meter certification shall be submitted to the Owner for approval prior to testing.
 - 3. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
 - 4. Leakage at mechanical couplings and joints, tapping sleeves, saddles, flanged joints, and copper piping will not be accepted. Correct any visible leaks.
 - 5. Push-on joints: Test ductile iron pipe for leakage in accordance with AWWA C600 as shown in the following table:

TABLE 1
Allowable Leakage per 1000 feet of DIP Pipeline (Gal/Hr)

Average Test Pressure	Nominal Pipe Diameter - Inches									
(psi)	3	4	6	8	10	12	14	16	18	20
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12

6. When the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
7. Test polyvinyl chloride pipe for leakage in accordance with the recommendations of the Uni-Bell Plastic Pipe Association (UNI) as shown in the following table:

TABLE 2
Allowable Leakage per 1000 feet or 50 joints of PVC Pipeline (Gal/Hr)

Nominal Pipe Size (inches)	Average Test Pressure in Line (psi.)	
	200	250
4	0.38	0.43
6	0.57	0.64
8	0.76	0.85
10	0.96	1.07
12	1.15	1.28
14	1.34	1.50
16	1.53	1.71
18	1.72	1.92
20	1.91	2.14

8. Should any section of new pipe fail to pass either test, locate and repair the defective pipe and repeat the test.

3.15 STERILIZATION AND FLUSHING

A. General:

1. Disinfect domestic water lines, mains, and branches by chlorination in accordance with AWWA C601 and as herein specified.

B. Sterilization Methods:

1. Liquid Chlorine Solution Method:
 - a. Flush all foreign matter from mains, branch runs, hydrant runs, and installed services.
 - b. Introduce liquid chlorine solution at appropriate locations to assure uniform distribution through the facilities at the proper concentration.
 - c. Do not use installed copper service lines to convey the concentrated

- chlorine solution to the mains.
- d. The sanitizing solution shall be retained in the facilities for a period of 24 hours after which each service, hydrant run, branch run and dead end shall be flushed until:
 - i. Residual chlorine is less than 1 part per million.
 - ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.
 - e. Chlorine shall be a 1 percent solution (containing 10,000 parts per million available chlorine) or shall be obtained by use of dry chlorine in tablet form firmly attached to inside top of the pipe.
 - f. The required concentration of chlorine in the pipe is 50 parts per million. This concentration may be attained by adding 5 gallons of the chlorine solution to 1,000 gallons of water.
 - g. The weight of chlorine or chlorine compound required to make a 1 percent chlorine solution is as follows:

TABLE 3
One-Percent Chlorine Solution Mix

AMOUNT OF PRODUCT COMPOUND		QUANTITY OF WATER (in gallons)
High-Test Calcium Hypochlorite (65-70% Cl)	1 pound	7.50
Chlorinated Lime (32-35% Cl)	2 pounds	7.50
Liquid Laundry Bleach (5.25% Cl)	1 gallon	4.25
Liquid Chlorine (100% available chlorine)	0.62 pounds	7.50

2. HTH Tablet Method:

- a. The required concentration of chlorine in the mains may be obtained by the use of HTH tablets as produced by Olin Mathieson in the following quantities or approved equivalent:

TABLE 4
HTH Tablet (70%) Dosage
Number of Tablets Per Length of Pipe

Length of Section	DIAMETER OF PIPE				
	4 inches	6 inches	8 inches	10 inches	12 inches
13 feet	1	2	3	4	6
18 feet	1	2	3	5	6
20 feet	1	2	3	5	7
30 feet	2	3	5	7	10
36 feet	2	3	5	8	12
40 feet	2	4	6	9	14
100 feet	4	9	15	23	30

- b. Tablets are to be fastened to the inside top surface of each length of pipe using "Permatex No. 1" no earlier than the day pipe is laid.

- c. Tablets shall not be installed in the pipe and left overnight before laying and shall not be accessible at any time for casual pilferage by the general public or by children. Tablets shall be stored in a hermetically sealed container.
- d. The new water lines are to be slowly filled with water. Air is to be exhausted from each dead end, branch run, hydrant run, and installed service.
- e. Water shall be retained for a period of 24 hours, after which each service, hydrant run, branch run and dead end shall be thoroughly flushed to clear foreign matter and until:
 - i. Residual chlorine concentration is less than 1 part per million
 - ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.

B. Bacteriological Testing:

- 1. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory certified by the California Department of Health Services as an Environmental Testing Laboratory (ELAP).
- 2. Samples are to be taken at representative points as required by the Owner and authorities having jurisdiction.
- 3. The new water lines shall remain isolated and out of service until satisfactory test results have been obtained that:
 - a. Meet the requirements of the California Department of Health Services, Drinking Water Standards.
 - b. District has accepted the results as indicative of the bacteriological condition of the facilities.
 - c. If unsatisfactory or doubtful results are obtained from the initial sampling, repeat the chlorination process until acceptable test results are reported.

END OF SECTION

08/27/18

SECTION 33 30 00

SANITARY SEWER

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Exterior sanitary sewage system complete with manholes, cleanouts, and pipelines from points of connection to the interior plumbing system of the building to the existing sewage mains.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as repeated herein.

1.02 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the American Society for Testing and Materials (ASTM), apply to the work only to the extent specified by the reference. Refer to Section 01 42 19 for information concerning availability and use of references.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's catalog cuts of pipe, fittings, joints and couplings; valves; hydrants; and valve boxes.
- B. On a set of Contract Drawings, kept at the site during construction, the Contractor shall mark construction that is installed differently from that indicated. Locate materials installed underground by dimensions from fixed identifiable points whether installed as indicated or not.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.04 REGULATORY REQUIREMENTS

- A. Materials and installation shall be in accordance with the following documents hereinafter referred to as the "Standard Specifications". Local City or County Public Works Standards and Specification

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Delivery and Storage: Do not store materials directly on the ground. Support the pipe uniformly during shipping and storage. Do not stack higher than 4 feet nor stack with weight on bells. Cover plastic pipe to protect it from sunlight. Keep inside of pipe and fittings free of dirt and debris. Avoid scratching the pipe surface.
- B. Do not install pipe that is cracked, broken, gouged, scratched or forming a clear depression. Remove damaged pipe from the site.
- C. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope which avoids scratching the pipe. Pipes may be lowered by rolling on two ropes controlled by snubbing.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

- A. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 3034-16, Type PSM, SDR 26. Joints shall be solvent weld type meeting the requirements of ASTM D 2855-15 using solvent meeting the requirements of ASTM D 2564-12.

2.02 MATERIALS FOR MANHOLES

- A. Precast Concrete Units: Manhole sections shall comply with ASTM C 478 except that portland cement shall be Type II, low alkali. Gaskets for joints between section shall comply with ASTM C 443.
- B. Manhole Frame and Cover Sets: None.
- C. Concrete construction shall comply with Section 03 30 00.

PART 3 - EXECUTION

3.01 UTILITY CONNECTIONS

- A. Permits and Fees: Refer to the Conditions of the Contract for requirements for permits and fees.
- B. Connections to Plumbing Systems: Make connections of service laterals to plumbing facilities at a location 5 feet outside the building line as indicated. Connections shall be made utilizing standard prefabricated adaptors installed in accordance with the pipe manufacturer's recommendations.

3.02 EARTHWORK

- A. Trenching, bedding, backfilling, and compacting requirements are specified in Section 31 20 00.

3.03 INSTALLATION

- A. Pipe and Fittings: Inspect each section of pipe and fittings before lowering the pipe or fitting into the trench. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
 - 1. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or allow pipe to fall into trenches.
 - 2. When installing pipe in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
 - 3. When the pipe laying IS not in progress, including lunch hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.
 - 4. Vitrified Clay Pipe: Install in accordance with ASTM C 12.
 - 5. Polyvinyl Chloride (PVC) Piping and Fittings: Install in accordance with ASTM D 2321.

- B. Manholes: Install precast manhole sections in accordance with ASTM C 891. Provide gaskets at joints between sections.
- C. Cleanouts: Construct cleanouts of pipe and fittings extended to grade and provide ferrule and countersunk clean out plug.

3.04 CLEANING

- A. Rodding Sewers: All sanitary sewer lines shall be rodded out. Rodding shall be accomplished utilizing a rotary cutter which shall be full size of pipe being cleaned. The lines shall be flushed simultaneously. Rodding shall not take place until building is complete, but before occupancy. This construction shall be done in the presence of the Inspector.

END OF SECTION

08/27/18

Not Used:

2.01 PIPE AND FITTINGS

- A. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM 0 3034-00, Type PSM, SDR 26. [Joints shall be solvent weld type meeting the requirements of ASTM 0 2855-96 using solvent meeting the requirements of ASTM 0 2564-96a.] [Joints shall be elastomeric type meeting the requirements of ASTM 0 3212-96a using elastomeric seals meeting the requirements of ASTM F 477-99.]
- B. Acrylonitrile-Butadiene-Styrene (ABS) or Polyvinyl Chloride (PVC) Composite Sewer Pipe and Fittings: ASTM 0 2680-95a, Schedule 40 with solvent welded joints made with solvent meeting the requirements of ASTM 0 2235-96a for ABS pipe and ASTM 0 2564-96a for PVC pipe.

Installation:

- 6. Acrylonitrile-Butadiene-Styrene (ABS) Plastic Piping and Fittings: Install in accordance with ASTM D 2321.

SECTION 33 40 00

STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Foundation drainage, sub-drainage, and underground storm drainage systems complete with cleanouts, catch basins, inlets, manholes, piping, and connection of the roof drain lines specified in Division 22.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference.
- B. American Association of State Highway and Transportation Officials (AASHTO) American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's catalog cuts of pipe, fittings, joints and couplings; hydrants; meters; valves; and valve boxes.
- B. On a set of Contract Drawings, kept at the site during construction, mark construction that is installed differently from that indicated. Locate materials installed underground by dimensions from fixed identifiable points whether installed as indicated or not.
- C. Submittal procedures and quantities area specified in Section 01 33 00.

1.4 REGULATORY REQUIREMENTS

- A. Materials and installation shall be in accordance with the following documents hereinafter referred to as the "Standard Specifications".
- B. City of San Rafael public Works Standards and Specification.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Delivery and Storage: Do not store materials directly on the ground. Support the pipe uniformly during shipping and storage. Do not stack higher than 4 feet nor stack with weight on bells. Cover plastic pipe to protect it from sunlight. Keep inside of pipe and fittings free of dirt and debris. Avoid scratching the pipe surface.
- B. Do not install pipe that is cracked, broken, gouged, scratched or forming a clear depression. Remove damaged pipe from the site.
- C. Take special care to avoid injury to coatings and lining on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Hoist pipe with mechanical

equipment using a cloth belt sling or continuous fiber rope which avoids scratching the pipe. Pipes may be lowered by rolling on two ropes controlled by snubbing.

PART 2 - PRODUCTS

2.1 STORM DRAIN LINES

- A. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: Comply with Section 207-17 of the Standard Specifications.

2.2 FOUNDATION AND SUBSURFACE DRAIN PIPE

- A. Perforated Polyvinyl Chloride (PVC) Pipe: ASTM D 3034-16, SDR 26, may be used where height of fill above pipe does not exceed 35 feet.

2.3 CULVERTS

- A. Corrugated Steel Pipe and Coupling Bands: accordance with AASHTO M-190.

2.4 RELATED MATERIALS

- A. Precast Concrete Units: Catch basins and inlets shall meet the requirements of ASTM C 913-18 and manhole sections shall meet the requirements of ASTM C 478-18 except that portland cement shall be Type II, low alkali.
- B. Castings: Manufacture castings true to pattern free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Castings shall be of grey iron, ductile iron or steel as indicated or as required to withstand loadings.
 - 1. Grey Iron Castings: Meet the requirements of ASTM A 48-03(2016), Class 35.
 - 2. Ductile Iron Castings: Meet the requirements of ASTM A 536-84(2014), Grade 60-40-18.
 - 3. Steel Castings: Meet the requirements of ASTM A 27-17 for mild to medium strength castings and ASTM A 148-15a for high strength castings.
- C. Fabricated Steel Gratings and Frames: Fabricate from steel meeting the requirements of ASTM A 36-14 or ASTM A 576-17, Grades 1021, 1022, 1026, 1029 or 1030. Welding shall meet the requirements of AWS 01.1-96. Burrs, rough and sharp edges, and other flaws shall be removed. Warped pieces shall be straightened after all fabrication. No grating shall have openings greater than W' in any direction.
- D. Painting: Castings and steel fabrications shall be given one coat of bituminous paint.
- E. Concrete Appurtenances: Concrete for catch basins and manholes shall be 2500 psi at 28 days and conform to Section 33 00 00.
- F. Filter Fabric: Provide nonwoven polyester fabric. Acceptable products include, but are not limited to, the following or equal:

Crown Zellerbach; Fibertex 200
Celanese Fibers; Mirafi 140
DuPont; Typar

- G. Filter Material: Clean coarse sand and gravel or crushed stone 3/4 inch minimum to 1-1/2 inch maximum, free draining.

PART 3 - EXECUTION

3.1 TRENCHING

- A. Trenching is specified in Section 31 23 33.
- B. Trench bottom shall be accurately graded to provide uniform bearing and to support pipe, and a uniform slope of not less than 0.2 percent unless otherwise indicated. Excavate for pipe hubs. Remove unsuitable soils or rock to depths deemed necessary.

3.2 CONNECTIONS TO APPURTENANCES

- A. Where pipe connects into catch basin inlet or manhole walls, sleeves may be installed in the forms; after the forms are removed, the pipe shall be dry packed in place.

3.3 INSTALLATION OF SUBSURFACE DRAINS

- A. Bedding: Line the trench with filter fabric with joints in fabric lapped not less than 4 inches. Cover the bottom of the trench, full width, with 4 inches of filter material.
- B. Pipe laying: lay pipe with perforations at the bottom and with sections joined with couplings that will hold pipe firmly in place without the use of sealing compounds or gaskets. Cutting and machining of asbestos pipe shall be done in accordance with OSHA and local Air Pollution Control District regulations.
- C. Backfilling: Place filter material over the pipe to the height indicated and wrap filter fabric over the top of the material. Backfill and compact remainder of the trench in accordance with Section 31 23 33.

3.4 INSTALLATION OF STORM DRAINS

- A. Pipe laying: Keep trenches dry and free of rocks, clods and other unsuitable material during laying and bedding operations. Open ends of pipe shall be closed temporarily at the end of each days work using wood blocks or bulkheads.
 - 1. Asbestos Cement Pipe: Install pipe in accordance with manufacturer's directions using compressive polyvinyl gaskets. Cutting and machining of asbestos pipe shall be done in accordance with OSHA and local Air Pollution Control District regulations.
 - 2. ABS Composite Pipe: Install pipe and make solvent welded joints in accordance with pipe manufacturer's directions.
 - 3. Polyvinyl Chloride Pipe: Install pipe in accordance with manufacturer's directions using solvent welded joints.
 - 4. Reinforced Concrete Pipe: Provide proper facilities for lowering pipe into trenches. lay pipe with groove ends in upgrade direction. Adjust tongues in grooves to give a uniform space all around. Use compressive polyvinyl gaskets in accordance with manufacturer's directions or mortar joints of 1 part portland cement to 2 parts sand with sufficient water to give mix a stiff consistency. Retempering of mortar will not be permitted.

- C. Backfilling: Do not backfill until elevations and dimensions of pipe are recorded on the Record Drawings. Backfilling and compaction are specified in Section 31 23 33.

3.5 INSTALLATION OF CULVERTS

- A. Handle pipe carefully so as not to damage bituminous coating. If coating is damaged, give damaged areas an application of bituminous material equal to that specified for the pipe. Make joints using coupling bands furnished with the pipe. Keep space between pipe and couplings free from dirt so that corrugations will fit snugly. While tightening the bands, tap them with soft-head mallet to take up the slack and ensure a tight joint. Backfill and compaction are specified in Section 31 23 33.

END OF SECTION

8/27/18

Not Used:

2.1 STORM DRAIN LINES

- A. Acrylonitrile-Butadiene-Styrene (ABS) Composite Plastic Pipe: ASTM 02680 -95a with solvent cement joints complying with ASTM D 2235-96a.

2.2 FOUNDATION AND SUBSURFACE DRAIN PIPE

- A. Perforated Corrugated Polyethylene Pipe: ASTM F 405-97, may be used where height of fill above pipe does not exceed 8 feet.
- B. Perforated Polyvinyl Chloride (PVC) Pipe: ASTM D 3034-11, SDR 26, may be used where height of fill above pipe does not exceed 35 feet.
- C. Perforated Acrylonitrile-Butadiene-Styrene (ASS): ASTM D 2751-05 SDR 26, may be used where height of fill above pipe does not exceed 35 feet.

Note: ASTM D 2751 has been withdrawn; no replacement.