

PROJECT MANUAL

**TERRA LINDA HIGH SCHOOL
MODERNIZATION
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.: 01-118754
PTN: 65466-34
HED PROJ. NO. 2019-05785**

**DSA APPROVAL
MAY 2020**

HED

417 Montgomery Street, Suite 400

San Francisco

California 94104

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PROJECT

TERRA LINDA HIGH SCHOOL - MODERNIZATION
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San Rafael, California 94903

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(510) 715-6018 Fax (510) 372-0259

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(510) 237-7745 Fax (510) 237-5751

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Oakland, California 94621
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SEALS PAGE

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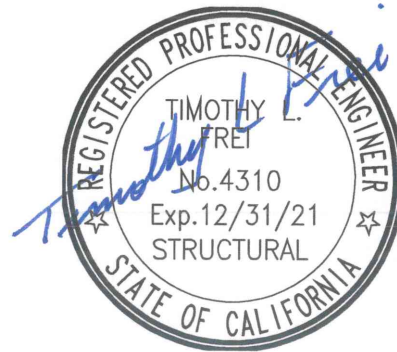
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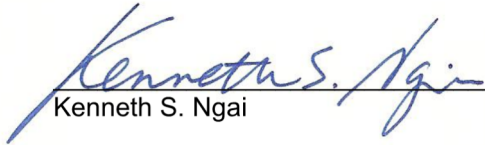
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M-34214

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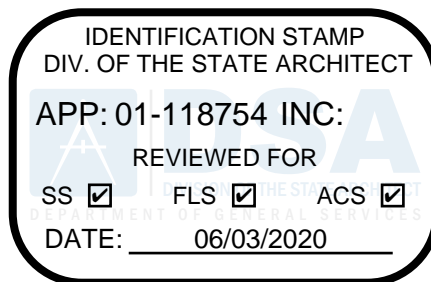



Kenneth S. Ngai

E-11537

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DOCUMENT 00 01 08

DEFERRED APPROVAL ITEMS

1. Section 08 41 13 - Aluminum-Framed Entrances and Storefronts.
2. Section 08 44 13 - Glazed Aluminum Curtain Walls.
3. Section 12 66 00 - Telescoping Stands.

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.

END OF DOCUMENT

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PC SHADE STRUCTURE (DSA P.C. 04-118151)

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DOCUMENT 00 31 26

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. An existing Pre-Renovation Hazardous Materials Survey for Project, prepared by Terracon Consultants, Inc., dated February 21, 2020, is available for viewing at the office of Owner.
- 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.
 - 3. Section 02 41 19 "Selective Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT

05/01/20

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:

Preliminary Geotechnical Investigation and Geologic Hazards Study Report
Terra Linda High School
320 Nova Albion Way
San Rafael, Marine County, California\

Prepared by: A3GEO, Inc.
Date: March 16, 2017

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

Supplemental Geotechnical Recommendations – Shade Structures
Terra Linda High School
San Rafael, Marin County, California

Prepared by: A3GEO, Inc.
Date: January 17, 2020

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

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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:
 - 1. Building A, C, E, M, L: Removal and replacement of storefront windows, finishes, and site work. Classroom reconfiguration, ceiling, and utility caps.
 - 2. Building K: Gym bleachers replacement; finishes.

1.03 CONTRACTS

- A. Perform the Work under a single, fixed-price Contract.

1.04 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.
- C. Owner-Furnished, Owner-Installed Products:
 - 1. TBD.

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

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SECTION 01 21 00

ALLOWANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Non-specified work.

1.2 RELATED SECTIONS

- A. Section 01 11 00 (Summary of Work).
- B. Section 01 29 00 (Payments and Completion).
- C. Section 01 33 00 (Submittals).

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

05/01/20

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

01/22/20

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

01/22/20

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

01/22/20

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

01/22/20

TERRA LINDA HIGH SCHOOL – MODERNIZATION 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 – Modernization, 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.

SECTION 01 31 19
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

01/22/20

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

01/22/20

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

01/22/20

SECTION 01 35 13.23

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

01/22/20

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

01/22/20

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) 2019 California Building Standards Administrative Code, Part 1, Title 24, CCR.
 - (2) 2019 California Building Code (CBC), Part 2, Title 24, CCR; (2018 International Building Code, Vol. 1 & 2, and 2019 California Amendments).
 - (3) 2019 California Electrical Code (CEC), Part 3, Title 24, CCR; (2017 National Electrical Code and 2019 California Amendments).
 - (4) 2019 California Mechanical Code (CMC), Part 4, Title 24, CCR; (2018 IAPMO Uniform Mechanical Code and 2019 California Amendments).
 - (5) 2019 California Plumbing Code (CPC), Part 5, Title 24, CCR; (2018 IAPMO Uniform Plumbing Code and 2019 California Amendments).
 - (6) 2019 California Energy Code (CEC), Part 6, Title 24, CCR.
 - (7) 2019 California Fire Code (CFC), Part 9, Title 24, CCR; (2018 International Fire Code and 2019 California Amendments).
 - (8) 2019 California Green Building Standards Code (CALGreen), Part 11, Title 24 CCR.

- (9) 2019 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, 2016 edition.
 - (c) NFPA 17A - Wet Chemical Extinguishing Systems, 2017 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 4-342.
- (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: Storefront Window and Curtain Wall systems; and Telescoping Stands (Bleachers).

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF SECTION

05/01/20

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

01/22/20

SECTION 01 42 19

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

01/22/20

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 2019 CBC, unless otherwise specified: Refer to attached DSA-103 – Listing of Structural Tests and Special Inspections – 2019 CBC.

PART 3 - EXECUTION Not Used.

END OF SECTION

05/01/20

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2019 CBC

Application Number: 01-118754

School Name: Terra Linda High School

School District: San Rafael City Schools

DSA File Number: 21-H1

Increment Number:

Date Submitted: 5/5/2020

2019 CBC

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 (2019 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
Continuous – Indicates that a continuous special inspection is required	GE – Indicates that the special inspection shall 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 special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335.
Test – Indicates that a test is required	PI – Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA.
	SI – Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.

DGS DSA 103-19 (Revised 4/2020)

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Geotechnical Reports: Project has a geotechnical report, or CDs indicate soils special inspection is required by GE

Table 1705A.6				
1. GENERAL:	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify that: <ul style="list-style-type: none">• 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.• 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.)

Table 1705A.6				
2. SOIL COMPACTION AND FILL:	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Perform classification and testing of fill materials.	Test	LOR*	* Under the supervision of the geotechnical engineer.
<input type="checkbox"/>	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. (Refer to specific items identified in the Appendix for exemptions where soils SI and testing may be conducted under the supervision of a geotechnical engineer or LOR's engineering manager. In such cases, the LOR's form DSA 291 shall satisfy the soil SI and test reporting requirements for the exempt items.)
<input type="checkbox"/>	c. Compaction testing.	Test	LOR*	* Under the supervision of the geotechnical engineer. (Refer to specific items identified in the Appendix for exemptions where soils testing may be conducted under the supervision of a geotechnical engineer or LOR's engineering manager. In such cases, the LOR's form DSA 291 shall satisfy the soil test reporting requirements for the exempt items.)

Table 1705A.7		
3. DRIVEN DEEP FOUNDATIONS (PILES):		

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Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/> a. Verify pile materials, sizes and lengths comply with the requirements.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/> b. Determine capacities of test piles and conduct additional load tests as required.	Test	LOR*	* Under the supervision of the geotechnical engineer.
<input type="checkbox"/> c. Inspect driving operations and maintain complete and accurate records for each pile.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/> d. Verify locations of piles and their plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and record any pile damage.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/> e. Steel piles.	Provide tests and inspections per STEEL section below.		
<input type="checkbox"/> f. Concrete piles and concrete filled piles.	Provide tests and inspections per CONCRETE section below.		
<input type="checkbox"/> g. For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	*	*	* As defined on drawings or specifications.

4. CAST-IN-PLACE DEEP FOUNDATIONS (PIERS): Table 1705A.8			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/> 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.)
<input checked="" type="checkbox"/> b. 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.)

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<input checked="" type="checkbox"/>	c. Confirm adequate end strata bearing capacity.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
<input checked="" type="checkbox"/>	d. Concrete piers.	Provide tests and inspections per CONCRETE section below.		

5. RETAINING WALLS:

Test or Special Inspection		Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Placement, compaction and inspection of backfill.	Continuous	GE*	1705A.6.1. * By geotechnical engineer or his or her qualified representative. (See Section 2 above).
<input type="checkbox"/>	b. Placement of soil reinforcement and/or drainage devices.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>	c. Segmental retaining walls; inspect placement of units, dowels, connectors, etc.	Continuous	GE*	* By geotechnical engineer or his or her qualified representative. See DSA IR 16-3.
<input type="checkbox"/>	d. Concrete retaining walls.	Provide tests and inspections per CONCRETE section below.		
<input type="checkbox"/>	e. Masonry retaining walls.	Provide tests and inspections per MASONRY section below.		

6. OTHER SOILS:

Test or Special Inspection		Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Soil Improvements	Test	GE*	Submit a comprehensive report documenting final soil improvements constructed, construction observation and the results of the confirmation testing and analysis to CGS for final acceptance. * By geotechnical engineer or his or her qualified representative.

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<input type="checkbox"/>	b. Inspection of Soil Improvements	Continuous	GE*	* By geotechnical engineer or his or her qualified representative.
<input type="checkbox"/>				

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Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

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7. CAST-IN-PLACE CONCRETE			
Material Verification and Testing:			
Test or Special Inspection		Type	Performed By
<input checked="" type="checkbox"/> a. Verify use of required design mix.		Periodic	SI
<input checked="" type="checkbox"/> b. Identify, sample, and test reinforcing steel.		Test	LOR
<input checked="" type="checkbox"/> c. During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.		Test	LOR
<input checked="" type="checkbox"/> d. Test concrete (f'_c).		Test	LOR
Inspection:			
<input checked="" type="checkbox"/> e. Batch plant inspection: Periodic		See Notes	SI
<input checked="" type="checkbox"/> f. Welding of reinforcing steel.		Provide special inspection per STEEL, Category 19.1(d) & (e) and/or 19.2(g) & (h) below.	

8. PRESTRESSED / POST-TENSIONED CONCRETE (in addition to Cast-in-Place Concrete tests and inspections):			
Test or Special Inspection		Type	Performed By
<input type="checkbox"/> a. Sample and test prestressing tendons and anchorages.		Test	LOR
<input type="checkbox"/> b. Inspect placement of prestressing tendons.		Periodic	SI
<input type="checkbox"/> c. Verify in-situ concrete strength prior to stressing of post-tensioning tendons.		Periodic	SI

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<input type="checkbox"/>	d. Inspect application of post-tensioning or prestressing forces and grouting of bonded prestressing tendons.	Continuous	SI	1705A.3.4, Table 1705A.3 Item 9; ACI 318-14 Section 26.13
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9. PRECAST CONCRETE (in addition to Cast-in-Place Concrete tests and inspections):				
Test or Special Inspection		Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect fabrication of precast concrete members.	Continuous	SI	ACI 318-14 Section 26.13.
<input type="checkbox"/>	b. Inspect erection of precast concrete members.	Periodic	SI*	Table 1705A.3 Item 10. * May be performed by PI when specifically approved by DSA.

10. SHOTCRETE (in addition to Cast-in-Place Concrete tests and inspections):				
Test or Special Inspection		Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect shotcrete placement for proper application techniques.	Continuous	SI	1705A.19, Table 1705A.3 Item 7, 1908A.6, 1908A.7, 1908A.8, 1908A.9, 1908A.11, 1908A.12. See ACI 506.2-13 Section 3.4, ACI 506R-16.
<input type="checkbox"/>	b. Sample and test shotcrete (f'_c).	Test	LOR	1908A.5, 1908A.10.

11. POST-INSTALLED ANCHORS:				
Test or Special Inspection		Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Inspect installation of post-installed anchors	See Notes	SI*	1617A.1.19, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic), 1705A.3.8 (See Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13. * May be performed by the project inspector when specifically approved by DSA.
<input checked="" type="checkbox"/>	b. Test post-installed anchors.	Test	LOR	1910A.5. (See Appendix for exemptions.)

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Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

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12. OTHER CONCRETE:			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>			

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17. STRUCTURAL STEEL, COLD-FORMED STEEL AND ALUMINUM USED FOR STRUCTURAL PURPOSES				
Material Verification and Testing:				
Test or Special Inspection		Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements. • Material sizes, types and grades comply with requirements.	Periodic	*	Table 1705A.2.1 Item 3a-3c, 2202A.1; AISI S100-16 Section A3.1 & A3.2, AISI S240-15 Section A3 & A5, AISI S220-15 Sections A4 & A6. * By special inspector or qualified technician when performed off-site.
<input checked="" type="checkbox"/>	b. Test unidentified materials	Test	LOR	2202A.1.
<input checked="" type="checkbox"/>	c. Examine seam welds of HSS shapes	Periodic	SI	DSA IR 17-3.
Inspection:				
<input checked="" type="checkbox"/>	d. Verify and document steel fabrication per DSA-approved construction documents.	Periodic	SI	Not applicable to cold-formed steel light-frame construction, except for trusses (1705A.2.4).

18. HIGH-STRENGTH BOLTS: RCSC 2014				
Material Verification and Testing of High-Strength Bolts, Nuts and Washers:				
Test or Special Inspection		Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the DSA-approved documents.	Periodic	SI	Table 1705A.2.1 Items 1a & 1b, 2202A.1; AISC 360-16 Section A3.3, J3.1, and N3.2; RCSC 2014 Section 1.5 & 2.1; DSA IR 17-8 & DSA IR 17-9.
<input checked="" type="checkbox"/>	b. Test high-strength bolts, nuts and washers.	Test	LOR	Table 1705A.2.1 Item 1c, 2213A.1; RCSC 2014 Section 7.2; DSA IR 17-8.
Inspection of High-Strength Bolt Installation:				
<input checked="" type="checkbox"/>	c. Bearing-type ("snug tight") connections.	Periodic	SI	Table 1705A.2.1 Item 2a, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Section 9.1; DSA IR 17-9.

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<input checked="" type="checkbox"/>	d. Pretensioned and slip-critical connections.	*	SI	Table 1705A.2.1 Items 2b & 2c, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Sections 9.2 & 9.3; DSA IR 17-9. * "Continuous" or "Periodic" depends on the tightening method used.
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19. WELDING:	1705A.2.5, Table 1705A.2.1 Items 4 & 5; 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; DSA IR 17-3 (See Appendix for exemptions.)
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Verification of Materials, Equipment, Welders, etc.:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	c. Verify WPS, welder qualifications and equipment.	Periodic	SI	DSA IR 17-3.

19.1 SHOP WELDING:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1-4; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Items 5a.5 & 5a.6; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect welding of stairs and railing systems.	Periodic	SI	1705A.2.1; AISC 360-16 (and AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3.
<input type="checkbox"/>	d. Verification of reinforcing steel weldability other than ASTM A706.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	e. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

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19.2 FIELD WELDING:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1-4; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16".	Periodic	SI	Table 1705A.2.1 Item 5a.5; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect end-welded studs (ASTM A-108) installation (including bend test).	Periodic	SI	2213A.2; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1; DSA IR 17-3.
<input type="checkbox"/>	d. Inspect floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Item 5a.6; AISC 360-16 (AISC 341-16 as applicable); AWS D1.3; DSA IR 17-3.
<input checked="" type="checkbox"/>	e. Inspect welding of structural cold-formed steel.	Periodic	SI*	1705A.2.5; AWS D1.3; DSA IR 17-3. The quality control provisions of AISI S240-15 Chapter D shall also apply. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	f. Inspect welding of stairs and railing systems.	Periodic	SI*	1705A.2.1; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	g. Verification of reinforcing steel weldability.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	h. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

20. NONDESTRUCTIVE TESTING: 1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Ultrasonic	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.

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<input type="checkbox"/>	b. Magnetic Particle	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; ANSI/ASNT CP-189, SNT-TC-1A; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/>				

21. STEEL JOISTS AND TRUSSES: 1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Verify size, type and grade for all chord and web members as well as connectors and weld filler material; verify joist profile, dimensions and camber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist.	Continuous	SI	1705A.2.3, Table 1705A.2.3; AWS D1.1; DSA IR 22-3 for steel joists only. 1705A.2.4; AWS D1.3 for cold-formed steel trusses.

22. SPRAY APPLIED FIRE-PROOFING: 1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-16				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Examine structural steel surface conditions, inspect application, take samples, measure thickness and verify compliance of all aspects of application with DSA-approved documents.	Periodic	SI	1705A.14.
<input type="checkbox"/>	b. Test bond strength.	Test	LOR	1705A.14.6.
<input type="checkbox"/>	c. Test density.	Test	LOR	1705A.14.5.

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23. ANCHOR BOLTS AND ANCHOR RODS:

<input type="checkbox"/>	a. Anchor Bolts and Anchor Rods	Test	LOR	Sample and test anchor bolts and anchor rods not readily identifiable per procedures noted in DSA IR 17-11.
<input type="checkbox"/>	b. Threaded rod not used for foundation anchorage.	Test	LOR	Sample and test threaded rods not readily identifiable per procedures noted in DSA IR 17-11.

23.1 OTHER STEEL:

<input type="checkbox"/>	Test or Special Inspection	Type	Performed By	Code References and Notes
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27. OTHER:			
	Test or Special Inspection	Type	Performed By
<input type="checkbox"/>	a. Load test for identified product(s):	Test	LOR
1709A.2, 1709A.3. Testing is not required for: 1) a product with a valid evaluation service report per DSA IR A-5, or 2) a product that can be justified by structural calculation.			
<input type="checkbox"/>	b. Installation torque for non-HS bolts	Continuous	SI*
Applicable to communication towers identified as Essential Service Facility Projects (ESFP). Calibrated wrench use required, verified by SI during installation. DSA Policy PL 18-01: Communication Towers, Poles and Buildings Utilized by State Agencies for Essential Services Communications.*EXCEPTION: Non-ESFP may use PI without need for notification to DSA.			
<input checked="" type="checkbox"/>	c. Shade Fabric Material Cert	CERT	Certification By Manufacturer, Accepted by Project Inspector
<input checked="" type="checkbox"/>	c. Bleachers		Test and Inspection Items required in Bleacher PC Dwgs
<input checked="" type="checkbox"/>	c.		

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Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

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Exempt items given in DSA IR A-22 or the 2019 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 / special inspections noted. **Items marked as exempt shall be identified on the approved construction documents.** The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
<input type="checkbox"/>	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per CBC Table 1806A.2 and having no geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
<input type="checkbox"/>	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception Item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC, Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill.

	CONCRETE/MASONRY:
<input type="checkbox"/>	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see Item 7 for "Welding") given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt Item 3 for "Welding."
<input type="checkbox"/>	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.
<input type="checkbox"/>	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1. Refer to construction documents for specific exemptions accordingly for each applicable wall condition.
<input type="checkbox"/>	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.
<input type="checkbox"/>	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

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DSA File Number: 21-H1

Increment Number:

Date Submitted: 5/5/2020

	Welding:
<input type="checkbox"/>	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.
<input type="checkbox"/>	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 shall not be ground flush.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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 Sections 19, 19.1 and/or 19.2 of listing above).
<input type="checkbox"/>	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 Sections 19, 19.1 and/or 19.2 of listing above).
<input type="checkbox"/>	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 located in the Steel/Aluminum category).
<input type="checkbox"/>	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

DGS DSA 103-19 (Revised 4/2020)

DIVISION OF THE STATE ARCHITECT

DEPARTMENT OF GENERAL SERVICES

STATE OF CALIFORNIA

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SIGNATURE), 2019 CBC

Application Number: 01-118754

School Name: Terra Linda High School

School District: San Rafael City Schools

DSA File Number: 21-H1

Increment Number:

Date Submitted: 5/5/2020

Name of Architect or Engineer in general responsible charge:

WALLACE GORDON

Name of Structural Engineer (When structural design has been delegated):

TIMOTHY L FRET

Signature of Architect or Structural Engineer:

Timothy L Fret

Date:

5/6/2020

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.

DSA STAMP

DGS DSA 103-19 (Revised 4/2020)

DIVISION OF THE STATE ARCHITECT

DEPARTMENT OF GENERAL SERVICES

STATE OF CALIFORNIA

DSA 103-19: LIST OF REQUIRED VERIFIED REPORTS, 2019 CBC

Application Number: 01-118754	School Name: Terra Linda High School	School District: San Rafael City Schools
DSA File Number: 21-H1	Increment Number:	Date Submitted: 5/5/2020

1. Soils Testing and Inspection: Geotechnical Verified Report Form DSA 293
2. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291
3. Concrete Batch Plant Inspection: Laboratory Verified Report Form DSA 291
4. Post-installed Anchors: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
5. Shop Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
6. Field Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292
7. High-Strength Bolt Installation Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

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

01/22/20

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

01/22/20

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

01/22/20

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

01/22/20

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

01/22/20

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

01/22/20

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

01/22/20

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

1/22/20

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

01/22/20

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

01/22/20

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 blue-line 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

01/22/20

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 portions of building.
 - 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, and Owner-occupancy 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. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control, and for noise control. Indicate proposed locations and construction of barriers.
- B. 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. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing buildings.
- C. 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: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Refer to Document 00 31 26 "Existing Hazardous Materials Information." Examine report to become aware of locations where hazardous materials are present.
 1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Pre-Renovation Hazardous Materials Survey.
- 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. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- D. 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.
- e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- f. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

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. Cover and protect furniture, furnishings, and equipment that have not been removed.
 4. 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.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

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) doors, windows, storefronts, and curtain-walls.

2. Designated (e) floor coverings.
3. Designated (e) casework.
4. Designated (e) sinks.
5. Designated (e) partitions.
6. Designated (e) ceilings.
7. Designated (e) lockers.
8. Designated (e) bleachers
9. Designated (e) fan and duct drop.
10. Designated (e) wall registers.
11. Designated (e) fire sprinkler heads.
12. Designated (e) fan control switch.
13. Designated (e) supply diffusers.
14. Designated (e) exhaust duct drop, ductwork, and ceiling diffusers.
15. Designated (e) range exhaust hood and venting through roof.
16. Designated (e) dryer, dryer vent, and vent cap on roof.
17. Designated (e) washer. Cap piping to behind wall.
18. Designated (e) sinks; cap pipes to below floor.
19. Designated (e) gas piping; remove and cap to below floor.
20. Designated (e) exhaust vent thru roof; typical for all gas ranges.
21. Designated (e) lighting fixtures and associated wires and conduit.
22. Designated (e) light switches.

B. Remove and Reinstall:

1. Rotate designated (e) supply branch ductwork.
2. Designated (e) duplex receptacles; reinstall at designated height.
3. Designated (e) data/tel outlet; reinstall at designated height.

C. Existing to Remain:

1. Designated (e) flooring to be refinished.
2. Designated (e) soffits.
3. Designated (e) lockers.
4. Designated (e) ac paving.
5. Designated (e) pavement markings.
6. Designated (e) concrete paving.
7. Designated (e) concrete curbs.
8. Designated (e) parking signs.
9. Designated (e) truncated domes.
10. Designated (e) concrete wheelstops
11. Designated (e) lock at vehicle gate.
12. Designated (e) chain link fencing and gates.
13. Designated (e) covered walkway.
14. Designated (e) utility enclosure.
15. Designated (e) overhead school entrance structure.
16. Designated (e) landscaping.
17. Designated (e) tow-away sign.
18. Designated (e) bike racks.
19. Designated (e) accessible drop-off area.
20. Designated (e) elevator.
21. Designated (e) lighting fixtures.
22. Designated (e) suspended ceiling grid.
23. Designated (e) fire sprinkler heads.
24. Designated (e) ac unit and ductwork.
25. Designated (e) control thermostats.
26. Designated (e) supply ductwork.

END OF SECTION

05/01/20

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. Form-release agent.

- B. Samples: Submit samples of form ties and spreaders.
- 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 2019 California Building Code (CBC) Title 24 Part 2, Chapter 19A - Concrete.
- B. CalGreen Requirements: Form coatings shall comply with environmental requirements of 2019 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.

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 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.

2.2 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.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, no less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris. Acceptable product or equal:
 1. Hohmann & Barnard, Inc. #305 Dovetail Slot, 20 gauge, hot-dip galvanized.
 2. Tru Supply Company; 20 Gauge Dovetail Anchor Slot, mill galvanized, foam filled.

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. 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. 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.
- S. 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.
- T. Tolerances: Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of ACI 117-10.
- U. Chamfered Corners: Chamfer exposed corners 3/4-inch, unless otherwise indicated. Provide molding in forms for all chamfering required.
- V. 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.
- W. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- X. 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.
- Y. 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.
- Z. 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 immediately 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 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.

END OF SECTION

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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 2019 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

05/08/20

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 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. Joint fillers.
 - 5. Sealer.
 - 6. 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. Slump limit.
 6. Air content.
 7. Nominal maximum aggregate size.
 8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 9. Intended placement method.
 10. 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. Curing process.
- 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. 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 2019 California Building Code (CBC) Title 24 Part 2 Chapter 19A - Concrete.
 2. CalGreen Requirements: Materials shall comply with environmental requirements of 2019 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. 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.
1. 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. 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.
- F. Water Used in Mixing Concrete: ASTM C94/C94M, potable, clean and free from deleterious amounts of acid, alkalis, organic or other materials.

2.3 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler: Premolded, of sizes and thicknesses indicated, meeting the requirements of ASTM D8139.
 1. Source: Nomaflex by Nomaco, Inc.
 2. Description: ASTM D8139, asphalt-free, semi-rigid, closed-cell polypropylene foam.
 3. Thickness: 1/2 inch.

- B. Expansion Joint Sealing Compound: Expansion joint sealant and backer rod is specified in Section 07 92 00.
- C. Drilled Anchors: Acceptable products, or equal:
 - Hilti; Kwik-Bolt TZ Expansion Anchors (ICC Report No. ESR-1917)
- D. 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.

2.4 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. Walls less than 8 inches in thickness: 1-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.

2.5 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for building walls and curbs.
 - 1. Exposure Class: ACI 318; F0, S0, W0, C0.
 - 2. Minimum Compressive Strength: 3500 psi at 28 days.
 - 3. Maximum w/cm: 0.50.
 - 4. Slump Limit: 4 inches.

2.6 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.

2.7 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. Mix designs shall be reviewed and approved by the Owner's Testing Laboratory for compliance with the contract documents, with "NO EXCEPTIONS TAKEN".
- C. Waiver of Continuous Batch Plant Inspection: If approved by DSA, batch plant inspection may be reduced to 'periodic' inspection subject to the requirements of CCR, T24 Sec. 1705A.3.3.1, or eliminated per Sec. 1705A.3.3.2.

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 JOINTS

- A. Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with 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 horizontal joints in walls and columns at underside of floors and slabs, and at top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. 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.

3.4 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. 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.
- D. 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.
- E. 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.

- F. 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 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.
- G. 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.
- H. 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.

3.5 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.

3.8 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.

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. If forms remain during curing period, moist cure after loosening forms.
 - 3. 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 Sheetting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

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. 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. Verification of use of required design mixture.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
- 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 2019 CBC Table 1705A.3.
 - 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.

3.14 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit use of pipe-cutting machinery over concrete surfaces.
4. Prohibit placement of steel items on concrete surfaces.
5. Prohibit use of acids or acidic detergents over concrete surfaces.

3.15 DEFECTIVE WORK

A. Remove and replace defective concrete construction at no cost to Owner.

END OF SECTION

05/08/20

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, nailers.
3. 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)

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. 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. Metal framing anchors.

B. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Rough carpentry shall conform to the 2019 California Building Code (CBC) Title 24 Part 2, Chapter 23 - Wood.
2. Framing anchors shall be furnished and installed in accordance with the manufacturer's current ICC Evaluation Services Report.

B. 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 all miscellaneous carpentry unless otherwise indicated.

2.3 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. 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 WWPA.
 5. Spruce-pine-fir (south); WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
- 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 WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; WCLIB, or WWPA.
 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, No. 2 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.

2.4 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.

2.5 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.

2.6 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Simpson Strong-Tie Company Inc. (A34).
USP Structural Connectors. (MP34)

- 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-preservative-treated lumber and where indicated.

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 2019 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

01/22/20

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.
- B. Hardwood 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. 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

05/08/20

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 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)
- 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 2019 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.

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. Color(s): As selected by Architect from manufacturer's standard colors. 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. Wire Pulls: Back-mounted, "U" shaped stainless steel, nominal 4" long, 5/16 inch in diameter, US 32D finish. Acceptable products or equal:

Trimco; 562 Series
Doug Mocket & Company; No. DP57B

- 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:

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:

Knap & 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

01/22/20

SECTION 07 01 50

REPAIR OF MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: All labor, equipment, and materials to repair, maintain and protect the existing membrane roofing system at locations where mechanical and plumbing equipment is removed.
- 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 02 24 19 "Selective Demolition" for removal of designated mechanical and plumbing equipment on roof.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and trim.

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.

ASTM International (ASTM)

1.3 PRE-INSTALLATION MEETING

- A. Convene two weeks before starting work of this section. Meet at Project site with Installer, installer of each component of associated work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect/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:
- B. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 1. Review methods and procedures related to roofing work.
 - 2. Review structural loading limitations of deck.
 - 3. Review roofing systems requirements (drawings, specifications, and other contract documents).
 - 4. Review required submittals, both completed and yet to be completed.
 - 5. 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.
 - 6. Review required inspection, testing, certifying, and material usage accounting procedures.
 - 7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including provision of temporary roofing over occupied

- spaces.
8. Record 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.
 9. Review notification procedures for weather or non-working days.

1.4 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures", for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets documenting conformance with specified requirements.
- C. Manufacturer's Field Reports: Indicate deviations or deficiencies observed during site visits, record method of resolution.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
 1. Manufacturer will inspect completed work.
- B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.
 1. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Foreman on job site during all phases of bituminous sheet roofing work and at any time roofing work is in progress, proper supervision of workmen shall be maintained. A copy of the specifications shall be in the possession of the Supervisor/Foremen and on the roof at all times.

1.6 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 materials 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. Contractor shall secure all material and equipment on the job site. If material or equipment is stored on the roof, the contractor shall ensure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

1.7 FIELD CONDITIONS

- A. Coordinate roof repair installation with size, location and installation of roof mounted work.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Weather Condition Limitations: Do not apply materials during inclement weather or when a 40% chance of precipitation is expected.
- B. Materials shall be stored at room temperature until immediately prior to application when the ambient temperature is 40 deg F or below. Discontinue the application if the material can not be stored at a temperature which permits even distribution during application.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.9 WARRANTY

- A. Correct defective Work within two year period after Date of Substantial Completion.
- B. Provide two year contractor warranty for roof repair.
- C. Provide letter from The Garland Company with original warranty number 04001057 and approval of repair work.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Roofing work includes but is not limited to:
 - 1. Flashing installation at new penetrations.
 - 2. Install fill insulation where needed, base ply and modified cap sheet per details.
 - 3. All flashings to consist of one ply of base sheet set in mastic covered by an additional layer of modified bitumen membrane.

2.2 PERFORMANCE REQUIREMENTS

- A. Make roof weathertight and watertight. All drainage to flow off roof, do not permit standing water.

2.3 MATERIALS

- A. General: Materials as manufactured by The Garland Company, 415-971-2739.
- B. Base Ply and Base Flashing Ply: StressBase® 80.
- C. Field Membrane: StressPly® Plus FR Mineral, 135 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane reinforced with a dual fiberglass scrim and polyester mat, ASTM D-6162 Type III, Grade G.
- D. Modified Flashing Ply: 135 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane reinforced with a dual fiberglass scrim and polyester mat, ASTM D-6162 Type III, Grade G.

- E. Asphalt Primer: V.O.C. compliant, ASTM D-41.
- F. Asphalt Roofing Mastic: Flashing Bond® V.O.C. compliant, ASTM D-2822, Type II.
- G. Cold-Applied Silver Trowel-Grade Mastic: Garland Silver-Flash®.
- H. Reinforcing Fabric: Fiberglass Mesh; Garland GarMesh®.
- I. Roof Coating: Pyramic®.
- J. Insulation:
 - 1. Base layer: 1/2" coated wood fiber.
 - 2. Fiberglass mat-faced gypsum cover board: 1/4" DensDeck® Prime, Georgia-Pacific Gypsum.
 - 3. Tapered insulation: Perlite, sloped 1/2" per 12".
- K. Insulation Adhesive: Insul-Lock® HR urethane foam adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate surfaces to receive 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 Roof System Manufacturer and Installer.

3.2 INSTALLATION

- A. Infill insulation with 1/2" coated wood fiber and DensDeck gypsum cover board in cold insulation adhesive. If equipment support is in a cricket, infill tapered insulation prior to installing cover board. New insulation shall be 1/4" higher than existing.
- B. Scorch off roof coating a minimum of 12" from edge of cut in existing roof.
- C. Prepare all penetrations to be flashed and where shown on the drawings, with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.
- D. Adhere all plies with the following:
 - 1. With mastic. The base flashing and the modified membrane will be used as the flashing and nailed off 8" on center at all vertical surfaces.
- E. Solidly adhere entire sheet of base flashing and flashing membrane to the substrate.
- F. Seal all vertical laps of flashing membrane with a three-course application of Silver-Flash® and fiberglass mesh.
- G. Seal junction of flashing membrane and existing roof with a three-course application of Silver-Flash and mesh.
- H. Install all work in accordance with manufacturer's instructions.

- I. Coat all new membrane roofing with Pyramic roof coating.

3.3 INTERFACE WITH OTHER WORK

- A. Coordinate with roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with the roofing work as specified in other sections to avoid conflict or omission in waterproofing systems and to provide watertight installation.

3.4 FIELD QUALITY CONTROL

- 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 performance of 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. 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 Roofing Contractor at a negotiated price.
- D. If core cuts verify the presence of damp or wet materials, 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 of above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- F. 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.

3.5 CLEANING and PROTECTION

- A. Clean roof and surrounding surfaces.
- B. Protect installed work from subsequent construction operations.
- C. Do not permit traffic over unprotected roof surface.

END OF SECTION

05/08/20

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. 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 84 13 "Penetration Firestopping" for mineral wool firestopping insulation.
 - 2. 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. Sound retardant insulation within interior partitions:
 - 1. Type: Unfaced mineral fiber batts or blankets.
 - 2. Thickness: Not less than 2-3/4 inches at walls.
 - 3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 - 4. Installation Method: Friction fit between studs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. 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.

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. 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. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

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 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. Glass-Fiber Blanket Insulation, Unfaced: ASTM C 665, Type I; passing ASTM E 136 for combustion characteristics.
 - 1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. 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.

2.2 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C 665, Type IA (blankets without membrane facing); consisting of fibers; passing ASTM E 136 for combustion characteristics.
1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
- 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

2.3 AUXILIARY INSULATING MATERIALS

- A. Duct Tape: Black duct webbing tape, type as recommended by the insulation manufacturer.
- B. 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.
- C. 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.
- C. 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.
- D. 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 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. 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

01/22/20

SECTION 07 42 13.19

INSULATED METAL SPANDREL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Metal spandrel panels for installation in aluminum storefront and curtainwall. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into a window 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:
 - 1. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts: Metal spandrel panels used as infill glazing.
 - 2. Section 08 44 13 – Glazed Aluminum Curtain Walls: Metal spandrel panels used as infill glazing.
 - 3. Section 08 80 00 – Glazing: Glazing sealant.

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. American Architectural Manufacturers Association (AAMA)
 - 1. 605.2-92 High Performance Organic Coatings on Aluminum - (Kynar)
- C. ASTM International:
 - 1. ASTM D1781 - Climbing Drum Peel Test for Adhesives.
 - 2. ASTM D2794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
 - 3. ASTM D3359 - Method for Measuring Adhesion by the tape test.
 - 4. ASTM D3363 - Method for Film Hardness by Pencil Test.
 - 5. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.
- D. Porcelain Enamel Institute (P.E.I.):
 - 1. ASTM-C-282 - Spot Acid.
 - 2. ASTM-C-283 - Boiling Acid.
 - 3. ASTM-C-703 - Antimony Chloride Spall Test.
 - 4. ASTM-C-346 - Gloss Retention.
 - 5. ASTM-C-486 - Spall Resistance.
 - 6. Brinell Hardness - 600-700.

1.3 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.

1.4 ACTION SUBMITTALS

- A. Submittal procedures and quantities are specified in Section 01 33 00 – Submittals.
- 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: Include information not fully detailed in manufacturer's standard product data and the following:
 - 1. Layout and installation details, including anchors.
 - 2. Full-size section details of typical composite members.
 - 3. Installation details.
- D. Samples:
 - 1. Panel makeup: 2 samples, each 10" x 10".
 - 2. Two samples of each color and finish texture: 3" x 5".

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 feet, non-commutative.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver infill panels and accessories in manufacturer's original packaging, clearly identified with manufacturer's name, name and type of product, and finish.
- B. Store panels off the ground in an upright position, protected from the weather and other sources of damage.
- C. Handle to prevent twisting and other damage.
- D. Comply with additional requirements of the manufacturer.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Check openings by accurate field measurement before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

- B. 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.

1.9 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: Two 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 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 INSULATED METAL SPANDREL PANELS Drawing Designation: GT-3

- A. Laminated metal faced panels as manufactured by Mapes Industries, Inc.; www.mapes.com
 - 1. Basis-of-Design Product for Non-Rated Spandrel Panel: Mapes-R™ Insulated Composite Panel.
- 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.
- C. Manufacturer shall produce the aluminum skin and laminate the panel in the same controlled manufacturing environment.

2.2 PANEL 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. Composition: Two sheets of aluminum bonded to stabilizer substrates with a insulative core.

- C. Exterior Substrate: 1/8" tempered hardboard.
- D. Core: 2-lb density polystyrene, 3/4 inch thick.
- E. Interior Substrate: 1/8" tempered hardboard.
- F. Aluminum Faces: Manufacturer's standard thickness.
- G. Tolerances: 0.8% of panels dimension length and width; $\pm 1/16$ " thickness.
- H. Panel Thickness: Nominal 1" thick.
- I. R-Value: 4.73.
- J. U-Value: 0.21.

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. Exterior Finish: Clear Anodized Class 1.
- D. Interior Finish: Smooth Primed Aluminum.
 - 1. Color as selected by Architect.

2.4 ACCESSORIES

- A. Recommended for use as an infill panel component in window 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 sealants with a 20 year life are recommended.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Panel surfaces shall be free from defects prior to installation.
- B. Inspect framed openings before beginning installation.

3.2 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of panels.

- B. Erect panels plumb, level and true.
- C. Glaze panels securely and in accordance with approved shop drawings and manufacturer's instructions to allow for necessary thermal movement and structural support.
- D. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
- E. Weatherseal all joints as required using methods and materials as previously specified.
- F. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.
- G. Install panels in accordance with Section 08 80 00.

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

01/22/20

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formed wall sheet metal fabrications.

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 08 41 13 "Aluminum-Framed Entrances and Storefronts."
3. Section 08 44 13 "Glazed Aluminum Curtain Walls."
4. Section 08 51 13 "Aluminum Windows."
5. Section 08 56 19 "Pass Windows."

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 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, the sheet metal installer, and the installer of storefronts, curtainwalls, windows, and pass windows.

2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special flashing details, storefront and curtainwall curbs, and condition of other construction that affect sheet metal flashing and trim.
4. Review sheet metal flashing observation and repair procedures after flashing installation.
5. 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 wall openings flashing.
8. Include details of special conditions.
9. Include details of connections to adjoining work.
10. 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.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

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.

1.9 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.

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. 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. 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.

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:
- Master Builders; Masterflow 713

2.5 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. 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.
- G. Do not use graphite pencils to mark metal surfaces.
- H. 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.

2.6 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 Flashing at Storefront, Curtainwall, and Window openings: 0.032 inch thick.
3. Aluminum Brake Metal Flashing at Storefront and Curtainwall Jambs: 0.080 inch thick.
4. Stainless Steel Flashing at Storefront and Curtainwall 0.0516 inch thick (18 gauge).

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. 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 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.

3.5 INSTALLATION OF MISCELLANEOUS FLASHING

- A. 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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

05/08/20

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. Schedule: TBD.

END OF SECTION

01/22/20

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 at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

B. Only tested and listed firestop systems shall be used in specific locations as follows:

1. Safing slot gaps between edge of floor slabs and perimeter curtain walls.
2. Openings between structurally separate sections of wall or floors.
3. Gaps between the top of walls and ceilings or roof assemblies.
4. Expansion joints in walls and floors.

C. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

D. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
2. Section 09 22 16 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.2 DEFINITIONS

- A. Firestopping:** Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 REFERENCES

A. Underwriters Laboratories, Inc. (UL) Fire Resistance Directory, Volume II, updated annually:

1. Joint Systems (XHBN)
2. Perimeter Fire Containment Systems (XHDG)
3. Fire Resistance Ratings (BXRH)
4. Fill, Voids, or Cavity Material (XHHW)
5. Forming Materials (XHKU)

B. Omega Point Laboratories, Inc. (OPL) Listed Products Directory, Volume II, updated annually:

1. Fire Resistant Joint Systems

C. ASTM International:

1. ASTM C679 - Standard Test Method for Tack-Free Time of Elastomeric Sealants.

2. ASTM D6904 - Standard Practice for Resistance to Wind-Driven Rain.
 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 5. ASTM E1399 - Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Width of Architectural Joint Systems.
 6. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
 7. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Fire Stops.
 7. ASTM E2307 - Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
- D. International Firestop Council Recommended (IFC) Guidelines for Evaluating Firestop Systems Engineering Judgments
 - E. International Building Code (IBC 2015).
 - F. NFPA 101 - Life Safety Code
 - G. ANSI/UL 2079, "Tests for Fire Resistance of Building Joint Systems."

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

- A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- B. Firestop system installation shall meet requirements of ASTM E 1966 and/or ANSI/UL 2079 tested and listed assemblies that provide fire-resistance ratings not less than that of the construction in which the joint occurs.

- C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- D. Firestop systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- E. For those firestop applications that exist for which no tested and listed system is available through a manufacturer, an engineering judgment derived from similar tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents shall follow requirements set forth by the International Firestop Council.

1.8 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. The work is to be installed by a contractor with at least one of the following qualifications:
 - FM 4991 Approved Contractor
 - UL Approved Contractor
 - Manufacturer Accredited Fire Stop Specialty Contractor
- C. Installer shall have not less than 3 years experience with fire stop installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL or OPL label, where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.10 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.

1.11 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 at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E2307.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. RectorSeal.
 - d. Roxul Inc.
 - e. Specified Technologies, Inc.
 - f. Thermafiber, Inc.; an Owens Corning company.
 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. 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.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- F. 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 firestop products that have been tested in accordance with ASTM E 1966 and/or ANSI/UL 2079 for specific rated construction conditions conforming to construction assembly type, movement capability, spacing requirements, and fire-resistance-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
- D. Sealants for use as part of a perimeter fire barrier system between fire-resistance-rated floors and exterior wall assemblies, the following products are acceptable:
 - 1. Hilti Firestop Joint Spray (CFS-SP WB)
 - 2. Hilti Firestop Silicone Joint Spray (CFS-SP SIL)
- E. Provide a firestop system with an assembly rating as determined by ASTM E 1966 and/or ANSI/UL 2079 which is equal to the fire-resistance ratings of the construction in which the joint occurs.

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. Perimeter Joint Firestopping Systems: TBD.

END OF SECTION

01/22/20

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.
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.; Urexpan 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; Tremflex 834, Acrylic Latex Sealant

- 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. Type H Sealant: Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT. Acceptable products or equal:

The Dow Chemical Company; Dowsil™ 795
GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf NB
Pecora Corporation; 864NST, 895NST
Sika Corporation; Joint Sealants.
Tremco Incorporated; Spectrem 2, Spectrem 3

- I. 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:

For Nonporous Surfaces:

1/4" (minimum)
1/4" to 1/2"
Over 1/2"

For Porous Surfaces

JOINT DEPTH:

Minimum

1/4"
1/2 of width
Not Permitted

Maximum

1/4"
Equal to width

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"
<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"	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. Type H Sealant: Use for exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Structural and nonstructural glazing.
 - 2. Structural attachment of many panel systems.
 - 3. Weather sealing of most common construction materials including glass, aluminum, steel, painted metals, concrete, brick, and plastics.
 - 4. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between metal panels.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - e. Other joints as indicated on Drawings.
- I. 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

05/08/20

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Interior standard steel 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 71 00 "Door Hardware" for door hardware for hollow-metal doors.
 - 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.

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, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each frame type.
 - 2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 3. Locations of reinforcement and preparations for hardware.
 - 4. Details of each different wall opening condition.
 - 5. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 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 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 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated hollow-metal frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

1.7 QUALITY ASSURANCE

- A. Provide doors and frames meeting the requirements of either SDI A250.8 or NAAMM HMMA 861 for standard sizes and designs.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal 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 frame 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 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 frame with the appropriate opening identification symbol.

1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace hollow metal 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 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 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. Interior Frames: Extra Heavy-Duty Frames: ANSI/SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
 2. Materials: ASTM A1008, uncoated, steel sheet, minimum thickness of 16 gauge (0.053 inch).
 3. Construction: Full profile welded, grind welds smooth.
 4. Exposed Finish: Prime.

2.4 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 Anchor 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.

2.5 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.

2.6 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 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:
 1. 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.
 2. Compression Type: Not less than two anchors in each frame.
 3. 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.
 1. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 2. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- D. 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.

2.7 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.

2.8 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 frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
- B. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - 1. 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.
 - 2. Install frames with removable stops located on secure side of opening.
 - 3. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - 4. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
- C. Fire-Rated Openings: Install frames according to NFPA 80.
- D. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - 1. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- E. Solidly pack mineral-fiber insulation inside frames.
- F. In-Place Concrete or Masonry Walls: 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.
- G. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.

H. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb 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 at floor.

3.4 CLEANING AND TOUCHUP

A. 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

01/22/20

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core, five-ply flush wood doors for opaque finish.
2. Factory priming 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.
4. Section 09 91 00 "Painting" for field finishing 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 product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door trim for openings.
5. Door frame construction.
6. Factory-machining criteria.
7. Factory-priming specifications.

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. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.

4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Doors to be factory primed and application requirements.

C. Samples for Verification:

1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
2. 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. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

A. Manufacturer's 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.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 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 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.

1.8 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.

1.9 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 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 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 labels and certificates from WI certification program indicating that doors comply with requirements of grades specified.
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

- A. Interior Solid-Core Doors:
 - 1. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
 - 2. North American Architectural Woodwork Standards Grade: Custom.
 - 3. Faces: MDO.
 - a. Apply MDO directly to high-density hardboard crossbands.
 - 4. Exposed Vertical Edges: Any closed-grain hardwood.
 - a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - b. Fire-Resistant Composite Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.
 - 5. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-1 or Grade LD-2 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate the use of through-bolts.
 - b. WDMA I.S. 10 structural composite lumber.
 - 1) Screw Withdrawal, Door Face: 550 lbf.
 - 2) Screw Withdrawal, Vertical Door Edge: 550 lbf.
 - 6. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
 - a. Blocking for Fire-Resistant Composite Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
- B. Door Thickness: 1-3/4 inches thick unless otherwise indicated.

2.5 LITE FRAMES

- A. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.0359-inch (20-gage) thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated on Drawings. 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.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 1. Locate hardware to comply with DHI-WDHS-3.
 2. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 3. 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.

2.7 FACTORY PRIMING

- A. Doors for Opaque Finish: Factory prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 09 91 00 "Painting."

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. Install fire-rated doors in accordance with NFPA 80.

D. Install smoke- and draft-control doors in accordance with NFPA 105.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

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. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

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.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

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

01/22/20

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

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."
2. Section 07 92 00 "Joint Sealants."
3. Section 08 44 13 "Glazed Aluminum Curtain Walls."
4. Section 08 51 13 "Aluminum Windows" for operable windows installed in storefront system.
5. Section 08 56 19 "Pass Windows" for pass windows installed in storefront system.
6. Section 08 71 00 "Door Hardware."
7. Section 08 80 00 "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)
ASTM International (ASTM)
Architectural Aluminum Manufacturers Association (AAMA)
The Society for Protective Coatings (SSPC)

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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.
- B. Shop Drawings: For aluminum-framed entrances and 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 entrances and 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.
- C. Structural Calculations: Along with the shop drawings, submit structural calculations prepared, signed and sealed by a structural engineer registered in California. Calculations shall show that storefront framing and anchorage will withstand the wind, dead, seismic, and other loads specified herein. Design members in accordance with 2019 CBC Chapters 20 and 22A with allowable stresses not to exceed yield stresses stated therein. Show section property computations for all framing members.
- D. Fabrication Sample: Of typical vertical-to-horizontal intersection of aluminum-framed systems, made from 12" 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.
- E. Installation Instructions: Provide complete diagrams, templates, and installation instructions as required for the installation of the storefront system, in sufficient time so that backing, framing, and formwork can be properly installed, and so that the work of other trades will not be delayed.
- F. 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.
- G. Submittal procedures and quantities are specified in Section 01 33 00.
- 1.6 DIVISION OF STATE ARCHITECT DEFERRED APPROVAL
- A. Deferred approval required for all storefront window units.
- B. After Architect and Structural Engineer have 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.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. An NFRC Component Modeling Approach (CMA) generated label certificate shall be provided by the manufacturer. The label certificate shall be project specific and will contain the thermal performance ratings of the manufacturer's framing combined with the specified glass, and the glass spacer used in the fabrication of the glass, at NFRC standard test size as defined in table 4-3 in NFRC 100-2010.
- C. Product Test Reports: Provide test reports from AAMA accredited laboratories certifying the performance as specified in Article 2.1 and 2.2.
 - 1. Storefronts: Test reports shall be accompanied by the storefront manufacturer's letter of certification stating that the tested storefront meets or exceeds the referenced criteria for the appropriate storefront type.
 - 2. Entrance Doors: Test reports shall be accompanied by the entrance door manufacturer's letter of certification stating that the tested door meets or exceeds the referenced performance standard for the appropriate door type.
- D. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
- C. Source Limitations: Obtain aluminum framed storefront system, entrance door systems, glazed aluminum curtain walls, and fixed/projecting windows through one source from a single manufacturer.

- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Accessible Entrances: Comply with Accessibility requirements.

1.10 MOCKUPS

- A. 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 for type(s) of storefront elevation(s) as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging with identification labels intact.
- B. Store entrance and storefront sections out of contact with the ground and under a weather tight covering. Do not cover storefront and entrance 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.

1.12 FIELD MEASUREMENTS

- A. Secure accurate field measurements required for the manufacture and installation of aluminum entrance and storefront work. Consult with the various trades whose work adjoins this work and be responsible for all measurements and the working out of all details.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.13 WARRANTY – STOREFRONT SYSTEM

- A. Total Storefront Installation:
 - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total storefront installation. This includes the glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water and structural adequacy as called for in the specifications and approved shop drawings.
 - 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
 - B. Window Material and Workmanship: Provide written guarantee against defects in material and workmanship for 10 years from the date of final shipment.
 - C. Glass:
 - 1. Provide written warranty for insulated glass units that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.
 - 2. Warranty period shall be for 10 (ten) years.
 - D. Finish: Warranty period shall be for 10 years from the date of Substantial Completion.
- 1.14 WARRANTY – ENTRANCE DOOR SYSTEM
- A. Total Entrance Door Installation:
 - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total door installation which includes that of the manufacturer supplied doors, hardware, glass, glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, and structural adequacy as called for in the specifications and approved shop drawings.
 - 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
 - B. Window Material and Workmanship:
 - 1. Provide written guarantee against defects in material and workmanship for 5 years from the date of Substantial Completion.
 - C. Glass:
 - 1. Warranty period shall be for 5 (five) years.
 - D. Finish: Warranty period shall be for 10 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LABORATORY TESTING AND PERFORMANCE REQUIREMENTS – STOREFRONTS

- A. Test Units:
 - 1. Air, water, and structural test unit size shall be a minimum of two lites high and three lites wide.
 - 2. Thermal test unit sizes shall be 80" wide x 80" high with one intermediate vertical mullion and two lites of glass.

B. Test Procedures and Performance:

1. Air Infiltration Test:
 - a. Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf.
 - b. Air infiltration shall not exceed 0.06 cfm/sf of unit.
2. Water Resistance Test:
 - a. Test unit in accordance with ASTM E 331.
 - b. There shall be no uncontrolled water leakage at a static test pressure of 12.0 psf.
3. Uniform Load Deflection Test:
 - a. Test in accordance with ASTM E 330.
 - b. Deflection under design load shall not exceed L/175 of the clear span.
4. Uniform Load Structural Test:
 - a. Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in paragraph 2.1.C.
 - b. At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.
5. Condensation Resistance Test (CRF):
 - a. Test unit in accordance with AAMA 1503.1.
 - b. Condensation Resistance Factor (CRF) shall not be less than ____ (frame) when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below).
6. Condensation Resistance (CR):
 - a. With ventilators closed and locked, test unit in accordance with NFRC 500-2010.
 - b. Condensation Resistance (CR) shall not be less than ____ when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below).
7. Thermal Transmittance Test (Conductive U-Factor):
 - a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
 - b. Conductive thermal transmittance (U-Factor) shall not be more than ____ BTU/hr•ft²•°F when glazed with ____ center of glass U-Factor. (See Glass Comparison chart below).

Glass Comparison Chart				
Glass	C.O.G. ² U-Factor	U-Factor ¹	Frame CRF ³	CR ¹
1" IG	0.47	0.56 BTU/hr•ft ² •°F	56	36
1" IG	0.29	0.41 BTU/hr•ft ² •°F	56	37
1" IG	0.24	0.37 BTU/hr•ft ² •°F	56	37

¹U-Factor and Condensation Resistance (CR) are based on a nominal size of 47.25" x 59" with two lites of glass using NFRC-100, and 500 - 2010.

²Intercept® Spacer.

³Based on AAMA 1503.1

C. Project Wind Loads:

1. The system shall be designed to withstand the following loads normal to the plane of the wall:
 - a. Positive pressure of +20 psf at non-corner zones.
 - b. Negative pressure of -20 psf at non-corner zones.
 - c. Positive/Negative pressure of ± 23.6 psf at corner zones.

2.2 LABORATORY TESTING AND PERFORMANCE REQUIREMENTS – ENTRANCE DOORS

- A. Test Units: Air test unit shall be minimum size of 36" x 84".
- B. Test Procedures and Performances:
 - 1. Entrance doors shall conform to all requirements for the door type referenced in paragraph 2.4.B. In addition, the following specific performance requirements shall be met:
 - 2. Air Infiltration Test:
 - a. With door sash closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 1.57 psf.
 - b. Air infiltration shall not exceed 0.50 cfm/sf of unit, for single doors.
 - c. Air infiltration shall not exceed 0.10 cfm/sf of unit, for a pair of doors.
- C. Project Wind Loads: The system shall be designed to withstand the following loads normal to the plane of the wall: As specified in paragraph 2.1.C.

2.3 ALUMINUM STOREFRONT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EFCO Corp.; www.efcocorp.com; (Basis-of-Design).
 - 2. Arcadia, Inc.; www.arcadiainc.com
 - 3. Kawneer Company Inc.; www.kawneer.com
 - 4. Old Castle Building Envelope; www.oldcastlebe.com
 - 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: EFCO® Series 403 Thermal Flush-Glazed Shear Block Storefront.

2.4 ENTRANCE DOOR SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EFCO Corp.; www.efcocorp.com; (Basis-of-Design).
 - 2. Arcadia, Inc.; www.arcadiainc.com
 - 3. Kawneer Company Inc.; www.kawneer.com
 - 4. Old Castle Building Envelope; www.oldcastlebe.com
 - 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product: EFCO® Series D618 DuraStile™ Heavy Duty Wide Stile Entrance Door.

2.5 MATERIALS

- A. Aluminum: Extruded aluminum shall be 6063-T6 alloy and temper.
- B. Glass:
 - 1. For Storefront System: Solar Control Low-E Tinted Insulating Glass, as specified in Section 08 80 00 "Glazing".
 - 2. For Entry Doors: Laminated Glass, as specified in Section 08 80 00 "Glazing".
- C. Thermal Barrier:
 - 1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural

thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.

2. Barrier material shall be poured-in-place, two-part polyurethane. A nonstructural thermal barrier is unacceptable.

D. Door Hardware for Entrance Door Systems:

1. Hardware for aluminum entrances shall be furnished and installed in the doors by the door manufacturer.
2. Hardware for entrance doors (check with entrance door manufacturer for compatibility with door) is specified under Section 08 71 00 "Door Hardware" and shall be sent to the door manufacturer for application. The finish hardware supplier shall be responsible for furnishing physical hardware and templates of all hardware to the entrance door manufacturer prior to fabrication, and for coordinating hardware delivery requirements with the hardware manufacturer, the general contractor and the entrance door manufacturer to ensure the building project is not delayed.

2.6 FABRICATION – STOREFRONT SYSTEM

A. General:

1. Aluminum frame extrusions: Minimum wall thickness of 0.080".
2. Exposed work shall be carefully matched to produce continuity of line and design with all joints. System design shall be such that raw edges will not be visible at joints.

B. Frame:

1. Depth of frame: Not less than 4 1/2".
2. Face dimension: Not less than 2".
3. Frame components: Shear block construction.

C. Glazing: Units shall be "dry glazed" with gaskets on both exterior and interior of the glass.

2.7 FABRICATION – ENTRANCE DOOR SYSTEMS

A. General: Major portions of the door sections shall have 0.188" wall thickness. Glazing stop sections shall have 0.050" wall thickness.

B. Entrance Doors:

1. Bottom Rail: 10".
2. Top Rail: 6".
3. Middle Rail: 6".
4. Vertical Stiles: 6" (not including glass stops).
5. Depth: 1-3/4".

C. Construction:

1. Door stiles and rails shall have hairline joints at corners.
2. Heavy concealed reinforcement brackets shall be secured with screws and shall be of deep penetration and fillet welded.

D. Door Frame:

1. Depth of frame: Not less than 4 1/2".
2. Face dimension: Not less than 2".

- 3. Shear block construction: Utilized throughout.
 - 4. System design: Raw edges will not be visible at joints.
 - E. Glazing: Units shall be dry glazed with extruded pressure fitting aluminum glazing stops, and EPDM gaskets.
 - F. Weatherstripping: Wool pile weather stripping shall be installed in one stile of pairs of doors and in jamb stiles of center pivoted doors.
- 2.8 ALUMINUM FINISH
- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - B. Factory Finishing:
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 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.

3.2 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. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.
- E. Sealing materials specified shall be used in strict accordance with the manufacturer's printed instructions, and shall be applied only by mechanics specially trained or experienced in their use. All surfaces must be clean and free of foreign matter before applying sealing materials. Sealing compounds shall be tooled to fill the joint and provide a smooth finished surface.
- G. 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 or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.

3.3 ANCHORAGE

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.4 INSTALLATION OF OPERABLE UNITS

- A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.5 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."

3.6 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Install entrance 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.

3.7 ERECTION TOLERANCES

- A. Install aluminum-framed entrances and 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.

3.8 FIELD QUALITY CONTROL TESTING AND PERFORMANCE REQUIREMENTS

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 - 1. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - 2. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. and shall not evidence water penetration.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Testing Agency to prepare test and inspection reports.

3.9 PROTECTION AND CLEANING

- A. Protect the aluminum materials and finish against damage from construction activities and harmful substances. Remove any protective coatings as directed by the Architect. Clean the aluminum surfaces as recommended for the type of finish applied.

END OF SECTION

05/08/20

SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed aluminum curtain wall systems.
 - a. Conventionally glazed

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" for metal spandrel panels installed in Curtain Walls.
2. Section 07 92 00 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for entrance door systems installed in Curtain Walls.
4. Section 08 51 13 "Aluminum Windows".
5. Section 08 80 00 "Glazing" for curtain wall glazing.

1.2 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

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.

B. Shop Drawings: For glazed aluminum curtain walls. 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 type of 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. Structural Calculations: Along with the shop drawings, submit structural calculations prepared, signed and sealed by a structural engineer registered in California. Calculations shall show that curtain wall framing and anchorage will withstand the wind, dead, seismic, and other loads specified herein. Design members in accordance with 2019 CBC Chapters 20 and 22A with allowable stresses not to exceed yield stresses stated therein. Show section property computations for all framing members.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
- F. Fabrication Sample: Of typical vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" lengths of full-size components and showing details of the following.
 - 1. Joinery.
 - 2. Glazing.

1.5 DIVISION OF STATE ARCHITECT DEFERRED APPROVAL

- A. Deferred approval required for all glazed aluminum curtain wall units.
- B. After Architect and Structural Engineer have 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. 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. Provide test reports from AAMA accredited laboratories certifying the performance as specified in Article 2.1.
1. Test reports shall be accompanied by the curtain wall manufacturer's letter of certification stating that the tested curtain wall meets or exceeds the referenced criteria for the appropriate curtain wall type.
- D. Sample Warranties: For special warranties.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.
- 1.8 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 glazed aluminum curtain walls that meet or exceed performance requirements.
- C. Source Limitations: Obtain aluminum curtain wall system and aluminum-framed entrances and storefronts system through one source from a single manufacturer.
- 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.
- 1.9 MOCKUPS
- A. 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 type(s) of curtain wall elevation(s) indicated, in location(s) designated 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.
- 1.10 PROJECT CONDITIONS
- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle curtain wall material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after installation.

1.12 WARRANTY

- A. Total Curtain Wall Installation:
 - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total curtain wall installation. This includes the glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc. as it relates to air, water, and structural adequacy and the specifications and approved shop drawings.
 - 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
- B. Window Material and Workmanship: Provide written guarantee against defects in material and workmanship for 10 years from the date of Substantial Completion.
- C. Glass:
 - 1. Provide written warranty for insulated glass units, that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.
 - 2. Warranty period shall be for 10 (ten) years.
- D. Finish: Warranty period shall be for 10 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LABORATORY TESTING AND PERFORMANCE REQUIREMENTS

- A. Test Units:
 - 1. Air, water, and structural test unit size shall be a minimum of two stories high and three lites wide.
 - 2. Thermal test unit sizes shall be 80" wide x 80" high with one intermediate vertical mullion and two lites of glass.
- B. Test Procedures and Performance:
 - 1. Air Infiltration Test:
 - a. Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf.
 - b. Air infiltration shall not exceed 0.06 cfm/sf of fixed wall area.
 - 2. Water Resistance Test:
 - a. Test unit in accordance with ASTM E 331.
 - b. The test for static water penetration (ASTM E 331) shall be conducted at an air pressure difference of 15.0 psf. There shall be no water leakage as defined by AAMA 501.1, paragraph 5.5.
 - 3. Uniform Load Deflection Test:

- a. Test in accordance with ASTM E 330.
 - b. Deflection under design load shall not exceed $L/175$ for spans less than 162".
 - c. Deflection under design load shall not exceed $L/240 + 1/4"$ for spans greater than 162".
4. Uniform Load Structural Test:
 - a. Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in par. 2.1.C.
 - b. At conclusion of the test there shall be no glass breakage, permanent damage to fasteners, curtain wall parts, or any other damage that would cause the curtain wall to be defective.
5. Condensation Resistance Test (CRF):
 - a. Test unit in accordance with AAMA 1503.1.
 - b. Condensation Resistance Factor (CRF) shall not be less than ____ (frame) when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below).
6. Condensation Resistance (CR):
 - a. With ventilators closed and locked, test unit in accordance with NFRC 500-2010.
 - b. Condensation Resistance (CR) shall not be less than ____ when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below).
7. Thermal Transmittance Test (Conductive U-Factor):
 - a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
 - b. Conductive thermal transmittance (U-Factor) shall not be more than ____ $\text{BTU/hr}\cdot\text{ft}^2\cdot^\circ\text{F}$ when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below.)

Glass Comparison Chart				
Glass	C.O.G. ² U-Factor	U-Factor ¹	Frame CRF ³	CR ¹
1" IG	0.47	0.62 $\text{BTU/hr}\cdot\text{ft}^2\cdot^\circ\text{F}$	67	*
1" IG	0.29	0.47 $\text{BTU/hr}\cdot\text{ft}^2\cdot^\circ\text{F}$	67	*
1" IG	0.24	0.43 $\text{BTU/hr}\cdot\text{ft}^2\cdot^\circ\text{F}$	67	*

* Please consult EFCO Product Tech Support department for values.

¹ U-Factor and Condensation Resistance (CR) are based on a nominal size of 47.25" x 59" with two lites of glass using NFRC-100, and 500 - 2010.

² Intercept® Spacer.

³ Based on AAMA 1503.1

8. Seismic Performance: Test unit in accordance to AAMA 501.4 system to meet design displacement of 0.010 x the greater adjacent story height and ultimate displacement of 1.5 x the design displacement.
9. Sound Transmission Loss:
 - a. Test unit in accordance with ASTM E 90-09(2016).
 - b. Sound Transmission Class (STC) shall not be less than 30.

C. Project Wind Loads:

1. The system shall be designed to withstand the following loads normal to the plane of the wall:
 - a. Positive pressure of +20 psf at non-corner zones.
 - b. Negative pressure of -20 psf at non-corner zones.
 - c. Positive/Negative pressure of ± 23.6 psf at corner zones.

2.2 SOURCE LIMITATIONS

- A. Obtain all components of curtain-wall system and aluminum window system, including framing, venting windows, entrances and accessories, from single manufacturer.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EFCO Corp.; www.efcocorp.com; (Basis-of-Design).
 - 2. Arcadia, Inc.; www.arcadiainc.com
 - 3. Kawneer Company Inc.; www.kawneer.com
 - 4. Old Castle Building Envelope; www.oldcastlebe.com
 - 5. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product Curtain Wall System: EFCO® Series 5900 Outside Glazed.

2.4 MATERIALS

- A. Aluminum:
 - 1. Extruded aluminum shall be 6063-T6 alloy and temper.
- B. Glass: Solar Control Low-E Tinted Insulating Glass, as specified in Section 08 80 00 "Glazing".
- C. Anchors: Perimeter and floor line anchors shall be aluminum or steel. All steel anchors shall be properly insulated from the aluminum.
- D. Thermal Barrier: Extruded EPDM used as an applied thermal isolator.

2.5 FABRICATION

- A. General: All aluminum vertical and horizontal main frame extrusions shall have a minimum wall thickness of 0.125".
- B. Frame: Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions.
- C. Glazing: Outside glazed curtain wall system shall be dry glazed with an exterior aluminum pressure plate and snap cover with interior and exterior dense EPDM preset gasket.

2.6 ALUMINUM FINISH

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean, provide a solid anchoring surface and are in accordance with approved shop drawings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material, leave all exposed surfaces and joints clean and smooth.
- 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 with 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.

3.3 ANCHORAGE

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.4 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."

3.5 ERECTION TOLERANCES

- A. 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.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Upon Architect's written request, provide periodic site visit by manufacturer's field service representative.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Test Area: Perform tests on representative area of glazed aluminum curtain walls.
 1. Air, water, and structural test unit size shall be a representative sample of typical construction and shall have no outstanding punch list or other visible defects. If no test area and/or location have been identified, the agency doing the test shall select an area. This area shall be selected to provide representative performance data, usually a minimum of 100 ft². The area to be tested shall include perimeter caulking, typical splices, frame intersections, and, if applicable, at least 2 entire vision lites and 2 entire spandrel lites containing an intermediate horizontal member. All operable components within the test area shall be isolated and exempt from the test procedure.
- D. Field Quality-Control Testing: Perform the following tests:
 1. Air Infiltration Test:
 - a. Test unit in accordance with AAMA 503-03 for field testing. The unit test shall be conducted at a minimum uniform static test pressure differential of at least 1.57 psf, but at a pressure differential not to exceed 6.24 psf.
 - b. The maximum allowable rates of air leakage for field testing shall not exceed 1.5 times the project specification rate or 0.09 cfm/sf, whichever is greater.
 2. Water Resistance Test:
 - a. Test unit in accordance with AAMA 503-03.
 - b. The field water penetration resistance tests shall be conducted at a static test pressure of two-thirds of the specified project water penetration test pressure, but not less than 6.24 psf.
- E. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- F. Testing agency to prepare test and inspection reports.

3.7 PROTECTION AND CLEANING

- A. Protect the aluminum materials and finish against damage from construction activities and harmful substances. Remove any protective coatings as directed by the Architect.

3.8 CLEANING

- A. Wash soiled surfaces with mild detergent solution, rinse with clear water, and wipe dry. Do not use harsh cleaning agents, caustics, or abrasives. Leave free of dirt, streaks, and labels.

END OF SECTION

05/08/20

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes aluminum windows for exterior locations.
- 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 41 13 "Aluminum Entrances and Storefronts" for aluminum venting windows furnished in Section 08 51 13, and installed in aluminum storefronts, and for coordinating finish among aluminum fenestration units.

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 National Standards Institute (ANSI)
ASTM International (ASTM)
American Architectural Manufacturers Association (AAMA)

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
 - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.04 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.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of hardware and accessories involving color selection.
- E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Provide test reports from AAMA accredited laboratories certifying the performance as specified in Article 2.02.
- C. Window manufacturer's letter of certification, stating the tested window meets or exceeds the referenced criteria for the appropriate window type.
- D. An NFRC Component Modeling Approach (CMA) generated label certificate shall be provided by the manufacturer. The label certificate shall be project specific and will contain the thermal performance ratings of the manufacturer's framing combined with the specified glass, and the glass spacer used in the fabrication of the glass, at NFRC standard test size as defined in Table 4-3 in NFRC 100-2017.
- E. Sample Warranties: For manufacturer's warranties.

1.06 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. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical window types as designated 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.

1.07 WARRANTY

- A. Total Window Installation:
 - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total window installation which includes that of the

- windows, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the specifications and approved shop drawings.
2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
- 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: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows, aluminum storefronts and entrances, and glazed aluminum curtain walls from single source from single manufacturer.

2.02 WINDOW LABORATORY TESTING AND PERFORMANCE REQUIREMENTS

- A. 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.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
1. Minimum Performance Class: AW.
 2. Minimum Performance Grade: PG110 for Projected Window; PG140 for Fixed Window.
- C. Test Units:
1. Air, water, and structural test unit shall conform to requirements set forth in AAMA/WDMA/CSA 101/I.S.2/A440-17 and manufacturer's standard locking/operating hardware and insulated glazing configuration.
 2. Thermal test unit sizes shall be 48" x 72". Unit shall consist of a project-out over fixed over project-in window.
- D. Test Procedures and Performances:
1. Windows shall conform to all AAMA/WDMA/CSA 101/I.S.2/A440-17 requirements for the window type referenced in par. 2.03.C. In addition, the following specific performance requirements shall be met:

2. Life Cycle Testing:
 - a. Test in accordance with AAMA 910. There shall be no damage to fasteners, hardware parts, support arms, activating mechanisms, or any other damage that would cause the window to be inoperable. Air infiltration and water resistance tests shall not exceed specified requirements.
3. Air Infiltration Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 6.27 psf.
 - b. Air infiltration shall not exceed 0.10 cfm/SF of unit.
4. Water Resistance Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 331/ASTM E 547 at a static air pressure difference of 15.0 psf.
 - b. There shall be no uncontrolled water leakage.
5. Uniform Load Structural Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 165.0 psf, both positive and negative.
 - b. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.
6. Forced Entry Resistance:
 - a. Windows shall be tested in accordance to ASTM F 588 or AAMA 1302.5 and meet the requirements of performance level 40.
8. Condensation Resistance Test (CRF):
 - a. Test unit in accordance with AAMA 1503.1.
 - b. Condensation Resistance Factor (CRF) shall not be less than ____ (frame) when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below.)
9. Condensation Resistance (CR):
 - a. With ventilators closed and locked, test unit in accordance with NFRC 500-2017.
 - b. Condensation Resistance (CR) shall not be less than ____ when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below.)
10. Thermal Transmittance Test (Conductive U-Factor):
 - a. With ventilators closed and locked, test unit in accordance with NFRC 100-2017.
 - b. Conductive thermal transmittance (U-Factor) shall not be more than ____ BTU/hr•ft²•°F when glazed with ____ center of glass U-Factor. (See Glass Comparison Chart below.)

Glass Comparison Chart				
Glass	C.O.G. ² U-Factor	U-Factor ¹	Frame CRF ³	CR ¹
1" IG	0.48	0.63 BTU/hr•ft ² •°F	53	33
1" IG	0.29	0.52 BTU/hr•ft ² •°F	53	34
1" IG	0.24	0.48 BTU/hr•ft ² •°F	53	34

¹ U-Factor and Condensation Resistance (CR) are based on a nominal size of 59" x 24" using NFRC-100, and 500 - 2017.

² Intercept® Spacer.

³ Based on AAMA 1503.1

E. Project Wind Loads:

1. The system shall be designed to withstand the following loads normal to the plane of the wall:
 - a. Positive pressure of +20 psf at non-corner zones.
 - b. Negative pressure of -20 psf at non-corner zones.
 - c. Positive/Negative pressure of ± 23.6 psf at corner zones.
2. Wind Design Load: As indicated on Drawing G-001.

2.03 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. EFCO Corporation; www.efcocorp.com; (Basis-of-Design).
 - 2. Arcadia, Inc.; www.arcaddiainc.com
 - 3. Kawneer North America, an Arconic company; www.kawneer.com
 - 4. Oldcastle BuildingEnvelope; www.oldcastlebe.com
 - 5. Substitutions: Section 01 25 13 "Product Options and Substitutions."
- B. Types: Provide the following types in locations indicated on Drawings:
 - 1. Projected, awning.
 - 2. Fixed.
- C. Basis-of-Design Product: EFCO® Series 2700 Thermal AW-PG110-AP Projected windows.
- D. Glass and Glazing:
 - 1. All units shall be factory glazed with Glass Type as indicated on Glazing Schedule.
 - 2. Reference Section 08 80 00 for Glass and Glazing.

2.04 MATERIALS

- A. Aluminum:
 - 1. Extruded aluminum: 6063-T6 alloy and tempered.
- B. Hardware:
 - 1. Locking handles: Cam type and manufactured from a white bronze alloy with a US25D brushed finish.
 - 2. Operating hardware: 4-bar stainless steel arms or equal.
- C. Weather-Strip: Santoprene® or equal.
- D. Glass: Solar Control Low-E Tinted Insulating Glass, as specified in Section 08 80 00 "Glazing."
- E. Thermal Barrier:
 - 1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
 - 2. Perimeter frame thermal barrier: Thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions.
 - 3. Sash and intermediate rails: Pour and debridge thermal barrier made of two-part polyurethane.

2.05 FABRICATION

- A. General:

1. All aluminum frame and vent extrusions shall have a minimum wall thickness of 0.125".
 2. Mechanical fasteners, welded components, and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and vent corners.
 3. Depth of frame and vent shall not be less than 2".
- B. Frame: Frame components shall be mortise and tenon. Other means of mechanically fastening, i.e., screws shall not be permitted.
- C. Ventilator:
1. All vent extrusions shall be tubular.
 2. Each corner shall be mitered, reinforced with an extruded corner key, hydraulically crimped, and "cold welded" with epoxy adhesive.
 3. Each vent shall utilize two rows of weather stripping installed in specifically designed dovetail grooves in the extrusion. The exterior gasket will be omitted at the vent bottom rail for project-out vents and at the vent top rail for project-in vents, allowing air to pressure equalize the void between the vents and frame.
- D. Glazing:
1. Units shall be glazed with the manufacturer's standard sealant process provided the glass is held in place by a removable, extruded aluminum, glazing bead. The glazing bead must be isolated from the glazing material by a gasket.
 2. Units shall be glazed with a minimum of 1/2" glass bite.

2.06 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.

2.07 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.01 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 wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. Furnish and apply sealants to provide a weather-tight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

3.03 ANCHORAGE

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - c. Performance values may be reduced due to deviations from the laboratory test unit such as product size, configuration, hardware selected, and glazing configuration.
 - 3. Water-Resistance Testing:

- a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - c. Performance values may be reduced due to deviations from the laboratory test unit such as product size, configuration, hardware selected, and glazing variations.
- 4. Testing Extent: Three windows of each designated type; types as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
- 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Testing agency shall prepare test and inspection reports.

3.05 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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SECTION 08 56 19

PASS WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Aluminum horizontal and vertical sliding pass windows.
- 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 41 16 - Plastic-Laminate-Faced Architectural Cabinets: Stainless steel clad countertop at pass windows.
 - 2. Section 07 92 00 - Joint Sealants.
 - 3. Section 08 51 13 - Aluminum Windows.

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)
American Architectural Manufacturers Association (AAMA)

1.3 ACTION SUBMITTALS

- A. Product Data: Submit product data to include construction details and fabrication methods, profiles and dimensions of individual components, data on hardware, accessories, and finishes.
- B. Shop Drawings: Submit shop drawings showing elevations and large scale details, with detail dimensions, methods of joining, field connections and anchorage, fastening and sealing methods, finishes and all pertinent information. Clearly show relationship to work of other trades.
- C. Samples: Submit samples of a major aluminum extrusion 12-inches long showing color of the specified finish. For anodized finishes, include sample sets showing the full range of variations of color expected.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.5 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.
- B. Deliver windows crated to provide protection during transit and job storage
- C. Upon delivery inspect windows for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
- D. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, discoloration, or other damage.

1.6 PROJECT CONDITIONS

- A. Cooperate with various other trades in coordinating their work required in conjunction with work under this section.
- B. Field measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.7 WARRANTY

- A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable products or equal:
 - 1. C.R. Laurence Co. Inc.; www.crlaurence.com; (Basis-of-Design).
 - a. Series DW1800A, Horizontal Sliding Service Window.
 - b. Series SWB 1214A, Vertical Sliding Service Window with Sash Balance.
 - 2. Substitutions: Section 01 25 13 "Product Options and Substitutions."

2.2 MATERIALS

- A. Frames: Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Poly-pile weather stripping and slide locks (vertical windows). Horizontal window glides on top-hung nylon slides. Overall frame sizes are to be in accordance with the contract drawings.
- B. Fasteners: Aluminum, nonmagnetic stainless steel or other noncorrosive material compatible with aluminum. Plated or coated materials not permitted.
- C. Weatherstripping: Double weatherstrip head, jambs and meeting rails with silicoated wool pile. Double weatherstrip bottom of active sash and screen with silicoated wool pile for counter seal.
- D. Glass and Glazing: Glass and glazing requirements are specified in Section 08 80 00.

1. Horizontal Sliding Service Window: 1/2-inch insulating glass, clear tempered.
 2. Vertical Sliding Service Window: 1/4-inch clear tempered.
- E. Sash Balance: Provide concealed sash balance at top of window frame for Vertical Sliding Service Window.
- F. Sealants: Specified in Section 07 92 00.
- G. Bituminous Coatings: Cold applied asphalt mastic meeting the requirements of SSPC PS 12-82, compounded for 30-mil thickness per coat.
- 2.3 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. Pulls: Provide units with integral pull handle and latch.
- C. Track: Manufacturer's standard top mounted, nylon; for horizontal sliding service window.
- D. Locks: Manufacturer's standard sliding bolt or pin type lock.
- 2.4 ALUMINUM FINISH
- A. Anodized Finish: Provide exposed aluminum surfaces with a clear anodized finish meeting the requirements of AA designation M12-C22-A41.
- B. Finish exposed fasteners to match the color finish of the adjacent material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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.

3.2 INSTALLATION

- A. Install the aluminum window units plumb, square, level and in accordance with the shop drawings and manufacturer's recommendations.
- B. Where aluminum surfaces are in contact with dissimilar metals, except stainless steel or zinc, protect the aluminum surface with one coat of alkali resistant bitumastic paint or zinc chromate paint.
- C. 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

- A. Make adjustments to assure that ventilators operate smoothly without binding and that weatherstripping permits ventilator to close easily and tight with weathertight contact between metal.

3.4 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.

3.5 PROTECTION

- A. Immediately before final completion remove the factory applied protective covering.

END OF SECTION

05/08/20

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary 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. Power supplies for electric hardware.
 - 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 12 13 – Hollow Metal Frames.
 - 2. Section 08 14 16 – Flush Wood Doors.
 - 3. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts.

1.3 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. 2019 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association.
- C. DHI – Door and Hardware Institute.
- D. NFPA - National Fire Protection Association:
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- E. UL - Underwriters Laboratories:
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware
- F. WHI - Warnock Hersey Incorporated.
- G. SDI - Steel Door Institute.

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 & 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) 1/2 TMS	(m) 626	(n) IVE
2	6A	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) - Manufacture 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.
- G. 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.
- H. 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.

1.7 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" 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 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
3. Smoke and Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & 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) 2013 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.
- H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.
- I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.
- J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.
- K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.
- L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

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.
- B. 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) 2013 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.

3.6 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.)

GLY =	Glynn-Johnson Corporation	Overhead Door Stops
IVE =	Ives	Hinges, Kick Plates, Door Stops & Silencers
LCN =	LCN	Door Closers
SCE =	Schlage Electronics	Door Cord
SCH =	Schlage Lock Company	Locks, Latches & Cylinders
VON =	Von Duprin	Exit Devices
ZER =	Zero International	Thresholds, Gasketing & Weather-stripping

GROUP NO. 01

1	EA	CONT. HINGE	112XY	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. 02

1	EA	CONT. HINGE	112XY	628	IVE
1	EA	DBL CYL STORE LOCK	ND66P6D RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	FLOOR STOP	FS439	682	IVE
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	OFFSET THRESHOLD	103	A	ZER

GROUP NO. 03

2	EA	CONT. HINGE	112XY	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. 04

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75P6D 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	WS401/402CCV	626	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

GROUP NO. 05

1	EA	CONT. HINGE	112XY	628	IVE
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CD-PA-AX-98-EO	626	VON
1	EA	ELEC PANIC HARDWARE	SD-EL-PA-AX-98-EO 24 VDC	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	THRESHOLD	PER DETAIL	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS 120/240VAC		VON
			CARD READER – FUTURE WORK; NOT IN SCOPE		

GROUP NO. 06

1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	SD-EL-PA-AX-98-EO 24 VDC	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	THRESHOLD	PER DETAIL	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS 120/240VAC		VON
			CARD READER – FUTURE WORK; NOT IN SCOPE		

GROUP NO. 07

1	EA	DOOR CORD	788C-18 WITH 20 GAUGE WIRES	626	SCE
1	EA	ELEC PANIC HARDWARE	SD-EL-PA-AX-98-EO 24 VDC	626	VON
1	EA	POWER SUPPLY	PS914 900-2RS 120/240VAC		VON
			CARD READER – FUTURE WORK; NOT IN SCOPE		
			BALANCE OF HARDWARE EXISTING TO REMAIN		

GROUP NO. 08

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

END OF SECTION

05/08/20

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.

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 2019 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 2019 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 GT-1)

- 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: GT-2)

- 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: GT-1)
 - 1. Minimum Thickness of Each Glass Ply: 3 mm.
 - 2. Interlayer Thickness: 0.030 inch.
 - 3. Safety glazing required.

3.9 INSULATED GLASS SCHEDULE (Drawing Designation: GT-2)

- 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

05/01/20

SECTION 08 88 13
FIRE-RESISTANT GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection-rated glazing materials installed as vision lights in fire-rated 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 include the following:

1. Section 08 14 16 "Flush Wood Doors" for vision panels in interior doors.

1.2 REFERENCES

A. ASTM International:

1. ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):

1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.
2. NFPA 252 – Fire Tests of Door Assemblies.
3. NFPA 257 – Fire Tests of Window Assemblies.

F. Underwriters Laboratories, Inc. (UL):

1. UL 9 – Fire Tests of Window Assemblies.
2. UL 10B – Fire Tests of Door Assemblies.
3. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

1.3 DEFINITIONS

- A. Glass Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

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. Comply with requirements of Section 01 33 00.
- B. Product Data: Submit manufacturer's technical data for each glazing material required, including installation and maintenance instructions.
- C. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

1.6 INFORMATIONAL SUBMITTALS

- A. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.
- B. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

1.7 QUALITY ASSURANCE

- A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.
- B. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.
- C. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per UL 10B, classified and labeled by UL.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials under provisions of Section 01 60 00.
- B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.
- C. Store off ground, under cover, protected from weather and construction activities.

1.9 WARRANTY

- A. Provide manufacturer's limited warranty under provision of Section 01 78 36.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer/Product: FireLite Plus® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site <http://www.fireglass.com>
- B. Substitutions: Section 01 63 00 "Product Substitution Procedures."

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.
- B. Fire-rated glass ceramic clear and wireless glazing material listed for use in non-impact safety-rated locations such as transoms and borrowed lites with fire rating requirements ranging from 20 to 90 minutes with required hose stream test.
- C. Passes positive pressure test standards UL 10C.

2.3 FIRE-PROTECTION-RATED GLAZING

- A. Properties:
 - 1. Thickness: 5/16 inch overall.
 - 2. Weight: 4 lbs./sq. ft.
 - 3. Approximate Visible Transmission: 85 percent.
 - 4. Approximate Visible Reflection: 9 percent.
 - 5. Fire-rating: 20 minutes to 3 hours for doors; 20 minutes to 90 minutes for other applications.
 - 6. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
 - 7. STC Rating: Approximately 38 dB.
 - 8. Surface Finish:
 - a. Premium Grade is finish ground and polished on both surfaces to provide superior surface quality, improving overall clarity and providing a surface that is unmatched by alternative products.
 - 9. Positive Pressure Test: UL 10C; passes.
- B. Maximum sheet sizes based on surface finish:
 - 1. Premium: 48 inches by 96 inches.
- C. Fire-Protection-Rated Glazing Labeling: Permanently label each piece of FireLite Plus® with the FireLite Plus® logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the FireLite Plus® label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).

- D. Fire Rating: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E2010-01, NPFA 252 and NFPA 257, UL 9, UL 10B and UL 10C.

2.4 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.
- B. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- C. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.5 FABRICATION OF GLAZING UNITS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings in Flush Wood Doors, with glazier present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 - 2. Minimum required face or edge clearances.
 - 3. Observable edge damage or face imperfections.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.
- C. Clean glazing channels receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 INSTALLATION (TAPE GLAZING)

- A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.
- B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.
- C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.

- D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
- E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.
- F. Place glazing tape on free perimeter of glazing in same manner described above.
- G. Install removable stop and secure without displacement of tape.
- H. Install in vision panels in fire-rated doors to requirements of NFPA 80.
- I. Install so that appropriate UL and FireLite Plus® markings remain permanently visible.

3.3 PROTECTION AND CLEANING

- A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.
- B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION

01/22/20

SECTION 08 91 19

FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers, for installation at designated curtain wall openings.

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. 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 axis 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. 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, flashings, sealants, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Sample Warranties: For manufacturer's special warranties.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. 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. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. 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. Wind pressures shall be considered to act normal to the face of the building.
 1. Wind Design Load: As indicated on Drawings.
- B. Seismic Performance: As indicated on drawings.
- C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Airolite Company, LLC (The). (Basis-of-Design; Model K6772)
 - b. Construction Specialties, Inc.
 - c. Ruskin Company.
2. Louver Depth: 2 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.063 inch for blades and 0.063 inch for frames.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
 - a. Free Area: Not less than 8.76 sq. ft. for 48-inch wide by 48-inch high louver.
 - b. Point of Beginning Water Penetration: Not less than 858 fpm.
 - c. Minimum Air Volume Flow Rate at Beginning Point of Water Penetration: 7,514 cfm.
 - d. Pressure Drop at Beginning Point of Water Penetration 0.10 in. H₂O.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers: Retain one or more of five subparagraphs below, or insert another mesh or wire size. If both bird and insect screening are required, indicate location of each on Drawings.

1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

3. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 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. Maintain equal louver blade spacing to produce uniform appearance.

C. 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.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide subsills made of same material as louvers, or extended sills for recessed louvers.

F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and 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.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

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 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers 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 weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

05/08/20

SECTION 09 05 61.13

MOISTURE VAPOR EMISSION CONTROL

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes: Fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor emission rate of high-moisture, interior concrete to prepare it for floor covering installation. Apply to existing concrete slab substrates that are scheduled to receive resilient flooring. Provide substrate suitable for installation of flooring by other sections to ensure provision of full warranty and service life of those finishes.
- B. Vapor control coating application for existing construction shall include shot blasting, coating application and cement topcoat layer to create a sustainable system for future flooring updates and replacements.
 - 1. Specialty curing, sealing, vapor-control coatings do not meet the intent of this section.
- 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 09 65 43 - Linoleum Flooring.

1.02 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 16 for information concerning availability and use of references.
- B. ASTM International:
 - 1. ASTM C109 / C109M - 11b Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - 2. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 3. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 4. ASTM E96 – Standard Test Methods For Water Vapor Transmission of Materials.
 - 5. 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.
 - 6. ASTM F710 – Standard Test Method for Preparing Floors To Receive Resilient Flooring.
 - 7. ASTM F1869 – Standard Test Method For Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 8. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes.

- B. California Department of Health Services – Section 01350 TVOC Testing.

1.03 DEFINITIONS

- A. MVE: Moisture vapor emission.
- B. MVER: Moisture vapor emission rate.

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Specified Product:
 - 1. Product Data: Provide data for concrete floor cleaning, coating and preparation materials.
 - 2. Installation methods: Indicate procedures and process.
 - 3. Mixing data.
 - 4. Installer Certificate: Manufacturer's acceptance of applicator.
 - 5. Warranty: Submit manufacturer's standard warranty, as specified.
- C. Alternate Products:
 - 1. Product Data: All products being used in the assembly of the control coating system.
 - 2. Installation Data: Indicate procedures and process.
 - 3. Laboratory Testing: Current independent laboratory reports. Reports shall be no greater than 2 years of age. Older test reports are not acceptable.
 - 4. Installer Certificate: Manufacturer's approved applicator's certificates for a warranted system.
 - 5. Warranty: Manufacturer's standard warranty certificate, including any and all exclusions.
 - 6. Insurance Certificate: Submit manufacturer's product liability insurance certificate. Refer to paragraph 1.10.D for dollar amount.

1.06 QUALITY ASSURANCE

- A. Coating Manufacturer Qualifications:
 - 1. Products with VOC content of less than 65 g/liter and which contribute to LEED points.
 - 2. Formula meets the California Department of Health Services emission chamber testing.
 - 3. Maintains long term warranty product liability insurance in the amount of \$6,000,000 per occurrence and capable of listing Owner as additionally insured.
 - 4. Employs factory-trained personnel who are available for consultation and Project-site inspection.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Existing Construction: Maintain temperatures of 55 to 85 degrees, 72 hours prior to, during and after application.

1.09 WARRANTY

- A. Section 01 78 36 – Warranties: Requirements for warranties.
- B. Correct defective Work within a fifteen (15) year period after Date of Substantial Completion. Manufacturer's warranty shall cover vapor emission coating failure including but not limited to suppression of water vapor emission, alkalinity and migrating salts through concrete surfaces. Emission levels after application shall meet flooring manufacturer's tolerances.
 - 1. Installation over existing construction shall include a cement topcoat to provide a sustainable surface for future flooring updates and replacements to allow warranty coverage to be extended.
- C. For warranty repair work, remove and replace flooring products, and vapor emission coating; provide required preparation materials and labor.
- D. 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. Provide products by one of the following manufacturers meeting specified requirements:
 - 1. Synthetics International; www.SyntheticsIntl.com "Synthetic30™"; Phone: (866) 646-0356.
 - 2. Diamond Stone Products; "Diamond-MTP" and "Diamond-VRS"; Phone: (888) 817-8663.
 - 3. Additional Manufacturers: None identified.
 - 4. Substitutions: Section 01 25 13 – Product Options and Substitutions.
- B. Basis-of-Design Product for Existing Subfloors: Synthetic30™. Synthetic30 is a two-component waterborne polymer designed to penetrate concrete slabs and seal cracks, joints and slab imperfections. The special resins allow the polymers to saturate porous concrete and embed a dense, high compressive film strength within the concrete to restrict water vapor emission, alkalinity migration and 100% relative

humidity transfer. The product may be covered with a moisture sensitive flooring system or used as a stand-alone floor finish.

1. Synthetic30's polymers improve the adhesion of flooring products by forming a surface that is unaffected by alkalinity and maintains moisture compliance. Flooring systems applied over the treated surface will exceed applications over concrete alone for compatibility.

2.02 VAPOR EMISSION COATING – PERFORMANCE REQUIREMENTS (SYNTHETIC 30)

A. Coating shall be third party laboratory tested in accordance with the following:

1. Water Vapor Transmission - WRT:
 - a. ASTM E96 Grains/ft²/hr of less than 0.6
 - b. ASTM E96 Pounds/1000ft²/ 24 hours of less than 2.0
 - c. ASTM E96 grams/h· m² of less than 0.7
2. Water Vapor Permeance - WVP:
 - a. ASTM E96 Perms (inch-pounds) of less than 1.4
 - b. ASTM E96 Grams/Pa· s· m² x 10⁻¹⁰ of less than 8.1
 - c. ASTM E96 Nanograms/ Pa · s · m² of less than 81.1
3. Alkali Resistance - 30 days:
 - a. ASTM D1308 - Resistant to 35% potassium hydroxide exposure
 - b. ASTM D1308 – Resistant to 14pH solution exposure
4. Concrete Adhesion - Pull off:
 - a. ASTM D4541 Adhesion of 375 to 600psi (100% concrete cohesive failure)
5. Low Emitting - VOC Content:
 - a. EPA Method 24 testing of less than 62 g/liter
 - b. Meets requirements of LEED EQ Credit 4.1
 - c. Contains no formaldehyde, formaldehyde precursors and zero-carcinogens
 - d. Contains zero hazardous air pollutants (HAP's)
 - e. Meets Section 01350 - California Department of Health Services Standard practice requirements for classroom and office space.

B. Coating Properties: Liquid applied penetrate and coating for suppressing, controlling and restricting water vapor emissions of 15 pounds and alkalinity resistance of 14pH.

1. Shall be a two-component, two-coat application of a proprietary low viscosity, polymers which form a highly insoluble film property resistant to 14pH (ASTM D1308) and water vapor reduction of 95 percent (ASTM E96).
2. Remain resistant to 100% RH per ASTM F2170 In-Situ Relative humidity exposure.
3. Application shall maintain a water vapor emission rate of less than 2.0 lbs. per ASTM F1869 during warranty period.

2.03 ACCESSORIES

A. Moisture Tolerant Primer: Two-component, low viscosity liquid for chemically bonding cement products to vapor control coating surfaces.

- B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.
- C. Cement Topcoat: Portland cement, single-component floor prep product by RAECO Cements (877) 763-1330 www.raecoinc.com; or equal. Product shall be applied at a nominal 1/8-inch thickness.
- D. ASTM F1869 Water Vapor Emission Test Kits: American Moisture Test, Inc. (866/670-9700)

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify concrete substrate meets minimum product requirements for a warranted installation. Consult with manufacturer's technical personnel for acceptable conditions.
- B. Do not proceed with installation until conditions are acceptable.
- C. Existing Construction:
 - 1. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
 - 2. Verify substrates meet manufacturer's requirements before starting work.
 - 3. Verify items which penetrate substrate to receive coating are securely installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
 - a. Installation of system indicates acceptance of surfaces and conditions.

3.02 PREPARATION - GENERAL

- A. Preinstallation Testing:
 - 1. Testing Agency: Owner will engage a qualified testing agency to perform tests.
 - 2. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Internal Relative Humidity Test: Using in situ probes, ASTM F 2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.
 - 3. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. area of MVE-control system to prepared concrete substrate and test according to ASTM D 7234.
 - a. Proceed with installation only where tensile bond strength is greater than 200 psi with failure in the concrete.

3.03 PREPARATION – EXISTING CONSTRUCTION

- A. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.
- B. Remove foreign materials detrimental to system, such as curing compounds, sealers, loose patching materials or surface oil. Foreign materials shall be removed by shot blasting with #390 to #420 shot.
- C. Vacuum clean all surfaces to remove dust, debris and shot. Do not acid etch or use clean sweeping agents.
- D. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.
- D. Seal all cracks, joints and slab imperfections in accordance with manufacturer's recommendations prior to coating installation.

3.04 MIXING

- A. Synthetic 30: Read all mixing data prior to use. Do not mix partial units. Follow manufacturer's written instructions.

3.05 APPLICATION - EXISTING CONSTRUCTION

- A. Apply to designated existing concrete substrates to restrict 100%RH per ASTM F2170 and alkalinity-pH of 14 in areas to receive finish flooring. No exceptions.
- B. General: Install MVE-control system according to ASTM F 3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.
 - 1. Install primers as required to comply with manufacturer's written instructions.
- C. Verify that surfaces are solid, free of loose particles, cracks, pits, rough projections or foreign matter detrimental to maximum adhesion of the system.
- D. When surface temperatures exceed 80 deg F, pre-dampen concrete with clean water using an airless sprayer.
- E. Allow the product to completely saturate the surface (approx. 20 min); broom areas that puddle.
- F. Pour product on designated concrete surfaces; drag with a squeegee, lint-free nap roller and/or nylon broom to saturate the concrete surface.
- G. Apply coating to saturate surface, cracks and joints in accordance with manufacturer's spread rates and curing requirements.
- H. Surface may be walked on during application wearing spike shoes.
- I. Spread evenly over the entire surface following specified spread rates.
- J. Use fans to increase air movement after application.
- K. Verify concrete temperature and interior humidity to allow proper drying.

- L. Typical curing times at 75 deg F - 30% RH with proper ventilation:
 - 1. Latex/ Acrylic Adhesives: 12 hrs. Epoxy Products: 24 hours.
 - 2. Urethane Products: 24 hrs. Non-Porous Primer: 12 - 24 hours.
- M. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.
- N. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.
- O. Install cement top-coat (patching-leveling product) over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.
 - 1. Apply moisture tolerant primer to secure all cement patching-leveling products to MVE-control coating.
 - 2. Mix and apply cement topcoat product to provide a smooth floor surface for flooring. This surface will offer a sustainable surface for future flooring updates and replacements.

3.06 FIELD QUALITY CONTROL

- A. Substrates not within moisture requirements shall be re-coated to maintain compliance for flooring products.

3.07 PROTECTION

- A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.
- B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION

01/22/20

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.

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" 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 2019 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.; SLP-TRK Slotted Deflection Track; ICC-ESR 2012.
 - b. ClarkDietrich Building Systems; MaxTrack™ (SLT); Intertek CCRR-0205.
 - c. Sliptrack Systems; SLP-TRK® Slotted Deflection Track; ICC-ESR 1042.
 - d. SCAFCO Steel Stud Manufacturing Co.; Slotted Track; IAPMO 0283.
- 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; ICC ESR 2012.
 - b. ClarkDietrich Building Systems; BlazeFrame DSLO, MaxTrak, or SLP-TRK Slotted Deflection Track; Intertek CCRR-0205.
 - c. Sliptrack Systems; SLP-TRK Slotted Deflection Track; ICC-ESR 1042.
 - d. SCAFCO Steel Stud Manufacturing Co.; Slotted Track; IAPMO 0283.
- 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 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

01/22/20

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. 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 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
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 2019 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.pabco gypsum.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 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.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.

- B. Joint Tape:

1. Interior Gypsum Board: Paper.

- 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 high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish. Acceptable products or equal:
 - a. Kelly-Moore Paints™; Level 5 – 988 High Build PVA Primer.
 - b. USG Sheetrock Brand Tuff-Hide™ Primer-Surfacer.
 - c. Benjamin Moore; Ultra Spec Prep-Coat High Build Latex Primer.
 - d. CertainTeed Level V Wall and Ceiling Primer / Surfacers with M2Tech®.

2.7 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 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.

3.5 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 panel surfaces that will be further finished to a Level 5 finish. 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 panel surfaces that will be exposed to view unless otherwise indicated. Where Level 5 gypsum board finish is indicated or specified (over properly prepared Level 4 finish, per paragraph 3.5.F.4 above), apply high-build interior coating product designed for application by airless sprayer, instead of skim coat, to produce Level 5 finish. Follow manufacturer application instructions for required wet film thickness and dry film thickness.
- 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.

3.6 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

01/22/20

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 2019 California Building Code (CBC), Title 24 Part 2, Sec. 2506.2.1; 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 2019 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® Impact™" 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® Impact™" by Rockfon® with following characteristics:
- 2. ASTM E1264 Classification: Type XX, Pattern E.
- 3. Edges: SQ.

4. Size: 24" x 24".
5. Thickness: 3/4".
6. NRC: 0.85.
7. CAC: 22.
8. Fire Class: Class A.
9. Fire Performance: UL 723 (ASTM E84) Flame Spread / Smoke Developed: 0/5.
10. Light Reflectance: 0.86.
11. Recycled Content: Up to 39%.
12. 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 2019 CBC Section 1617A Modifications to ASCE 7, as amended by Section 1617A.1.21, ASCE 7, Section 13.5.6.2 and Modifications to ASTM E580.
- 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

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SECTION 09 64 66.51

ATHLETIC MAPLE FLOOR RESURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Proper procedures and application for the resurfacing of an existing maple athletic floor.
2. Ventilated resilient wall base.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Layout, colors, widths, and dimensions of game lines and markers.

C. Samples: For each exposed product and for each color and texture specified, approximately 12 inches in size.

1. Include Sample sets showing finishes and game-line and marker paints applied to wood flooring.
2. Include sample of wall base.

1.3 INFORMATIONAL SUBMITTALS

A. Sport Floor Contractor Qualifications.

1.4 QUALITY ASSURANCE

A. The finishing products shall be approved and currently listed on the MFMA Athletic Flooring Sealer and Finish Conformance List.

1. <http://www.maplefloor.org/literature/finishlist.cfm>

B. The Sport Floor Contractor shall be a current member of the Maple Flooring Manufacturers Association.

1. <http://www.maplefloor.org/search/index.cfm>

C. The flooring contractor shall be an MFMA Mill Accredited Installation Company* with MFMA Accredited Installer(s)* on-site for the duration of the refinish.

1.5 WORKING CONDITIONS

A. Resurfacing of an existing floor system shall not commence until all masonry, finish and/or wet trades, such as, concrete, painting, etc., plastering/dry walling, tile and overhead mechanical trades are complete. The building must be enclosed and weather tight.

- B. Permanent heat, light and ventilation shall be installed and operating before, during and after the resurfacing is complete; MFMA recommends a temperature range of 55 degrees to 75 degrees and a relative humidity range compatible with expected environmental conditions when the facility is occupied. (Maintaining a maximum 15 percent seasonal difference between high and low humidity levels). Expected minimum/maximum indoor relative humidity will depend upon building design, geographic location, HVAC systems and operating schedules. Consult your local MFMA Sport Floor contractor for specific information.

1.6 WARRANTY

- A. Submit Finish Manufacturer's Warranty Information.
- B. Submit Sport Floor Contractor's Warranty Information.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and currently listed on the MFMA Athletic Flooring Sealer and Finish Conformance List. (<http://www.maplefloor.org/literature/finishlist.cfm>)
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: MFMA Group 5, Water-Based Finishes.
- B. Sandpaper shall consist of three grits:
 - 1. First cut (Course grit).
 - 2. Second Cut (Medium grit).
 - 3. Third Cut (Fine grit).
 - a. Follow selected finish manufacturers final cut recommendation to ensure proper adhesion of the finish.
- C. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.
- D. Design Diagram: As furnished by Architect; or supplied by Sport Floor Contractor (and approved by Architect).
- E. Finish Application Tools shall be approved by the finish manufacturer.

2.2 ACCESSORIES

- A. 3-inch wide toe. Provide premolded outside corners. Color: Black. Acceptable products or equal:
 - Robbins, Inc.; Ventilating Base
 - Connor/AGA; Vent-Cove Base
 - Horner; Gymcove Base
 - Johnsonite; Ventcove Base

- B. Adhesives: Manufacturer's standard for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The athletic maple system shall be cleared of athletic material by Owner's maintenance staff to ensure the sport floor contractor will have adequate access to the athletic maple system's surface.
- B. The athletic maple system surface shall be inspected and approved by the Sport Floor Contractor to ensure proper moisture content and eligible to receive a complete resurfacing.
- C. All, if any, repair work on the athletic maple system shall be completed prior to the start of the sanding process.

3.2 SANDING AND FINISHING PROCEDURES

- A. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors;"
 - 1. General: Follow selected finish manufacturer's recommendations.
- B. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
 - 1. Floors with many layers of finish may need additional cuts to remove all excess material.
 - 2. Vacuum and Tack the entire athletic floor system between each cut.
 - 3. The floor may need to be tacked and vacuumed multiple times.
- C. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 - 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.
- D. Follow selected finish manufacturer's recommendation on time allotted before foot traffic and activities can resume.

3.3 WALL BASE INSTALLATION

- A. Vent Base: Apply vent cove base over perimeter voids. Secure to walls with adhesive as recommended by base manufacturer, miter inside corners and use premolded outside corners.

3.4 PROTECTION

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 - 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 - 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

3.5 MAINTENANCE

- A. Upon completion of the resurfacing of the athletic maple system, the Owner, or Facility Department individuals in charge, are responsible for the upkeep of the building and are to see that the care and maintenance instructions of the MFMA and the flooring manufacturer are followed.

END OF SECTION

05/01/20

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 65 43 – Linoleum Flooring.

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

05/01/20

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 02 41 19 "Selective Demolition" for removal of existing resilient floor coverings.
 - 2. Section 09 05 61.13 "Moisture Vapor Emission Control."
 - 3. 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 2019 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, except for adhesive bond testing. Confirm that moisture vapor emission 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. Moisture vapor emission control treatment is specified in Section 09 05 61.13. All concrete slab surfaces scheduled to receive resilient flooring shall receive moisture vapor emission 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 moisture vapor emission control treatment as specified in Section 09 05 61.13 has been successfully applied to concrete slab substrates.

- E. Concrete pH Testing: Not required. Confirm that moisture vapor emission control treatment as specified in Section 09 05 61.13 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

01/22/20

SECTION 09 72 00

WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl wall covering.

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 77 23 "Fabric Covered Tack Paneling."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, fade resistance, and fire-test response characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.

C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, minimum 18" x 18" in size.

1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

C. Certificate of Compliance: Submit manufacturer's certification that wallcovering furnished meets or exceeds the specified requirements.

1. The manufacturer shall certify at the time of shipment that the materials furnished meet the published flame spread and smoke development Fire Hazard Classification Rating(s) of those products when tested according to ASTM-E84 Tunnel Test.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.5 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. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wall covering on typical substrate. Comply with requirements in ASTM F 1141 for appearance shading characteristics.
 - 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. Deliver vinyl wallcovering and adhesive to the job site in unbroken or undamaged containers and clearly marked with the supplier's identification label.
- B. Store vinyl wallcoverings in a flat position to avoid damage to roll ends. Store materials in a clean, dry storage area with temperature maintained above 55 deg F with normal humidity. Do not cross stack this material.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings 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 levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.9 WARRANTY

- A. Furnish a written warranty against defects in material or workmanship for five (5) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265.
- B. UL Label: All products shall be UL labeled assuring complete compliance with all specifications and requirements through continuous inspection by UL inspectors.
- C. Fire Detection Characteristics: Vinyl wallcovering shall contain the Early Warning Effect® formulation which provides early warning to potential fire conditions. Vinyl wallcovering shall contain thermo-particulating ingredients which, when heated to approximately 300 deg F, emit a colorless, odorless vapor that activates ionization smoke detectors when installed according to manufacturer's specifications. Evidence of the Early Warning Effect® shall be based on the ASTM E603 standard guide for room fire experiments.

2.2 VINYL WALL COVERING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide wallcovering from Koroseal School Collection; or comparable Koroseal collection; www.koroseal.com
- B. Description: Provide mildew-resistant products in rolls from same production run and complying with the following:
 - 1. FS CCC-W-408D and CFFA-W-101-D for Type II, Medium-Duty products.
- C. Total Weight: 21 oz/linear yard, excluding coatings.
- D. Width: 52 - 54 inches.
- E. Backing: Osnaburg fabric.
- F. Repeat: None.
- G. Stain-Resistant Coating: Koroclear. The vinyl wallcovering shall have a 0.37-inch thick protective coating factory-applied to its surface to minimize migration of stains into the vinyl and, therefore, offer stain protection from a variety of staining agents and provide greater ease of cleanability.
- H. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wallcovering manufacturer.
- B. Primer/Sealer: Mildew resistant, and recommended in writing by primer/sealer and wallcovering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Check substrate with a suitable "Moisture Meter". Moisture shall not exceed 4%.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 2. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper. If there is any possibility of pigment bleed-through, a coat of sealer, recommended by the manufacturer, should be applied before application of the wallcovering.
- E. If there is any evidence of mildew, it must be removed and the wall surface treated to inhibit further mildew growth.
- F. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- G. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. Install wallcovering in strict accordance with the manufacturer's printed instructions using vinyl wallcovering adhesive recommended by the manufacturer (WHEAT PASTE SHALL NOT BE USED). It is absolutely imperative that installer read the manufacturer's instruction sheet in each roll before installing the vinyl wallcovering. Permanent building light shall be available for installation.
- B. Before cutting, examine pattern and color and determine that they are the correct pattern and color as specified.
- C. Install each roll in sequence starting with largest roll number and each strip in same sequence as cut from roll. If pattern is not random, examine for repeat design. Some patterns should be lined up, matched or reversed for best results. If necessary, trim selvage deep enough to assure color uniformity.

- D. After application of three strips, make an inspection and if there are any variations in color or pattern which are felt to be excessive, notify the wallcovering distributor or manufacturer's representative for his inspection before any further wallcovering is installed.
- E. Always bring material six (6) inches around inside and outside corners being sure to fit into corners to avoid bridging or spanning.
- F. Smooth the wallcovering to the hanging surface with a stiff bristled sweep brush or a flexible broad-knife to eliminate air bubbles.
- G. Remove excess adhesive along finished seam immediately after each wallcovering strip is applied. Use of clean, warm water, a natural sponge, and clean towels are recommended for this use. It is very important to change water often to maintain cleanliness.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

05/08/20

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

01/22/20

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.

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: Must remove Passivators

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.; UNPR00 Enduraprime
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 Interior Undercoater
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.; VNSL00 Vinylastic Select Interior Wall Sealer
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 / SWLL50 Spartawall Semi-Gloss Zero VOC
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; 1406N Ultra Hide-250 Non-Blocking SG (50 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: 12 percent.
 - 4. Portland Cement Plaster: 12 percent.
 - 5. Gypsum Board: 1 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 (and Tectum Panels) 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

01/22/20

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Porcelain-on-steel markerboards.
 - 2. Horizontal sliding units.
 - 3. 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. Products 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 International)
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, trim and accessory required. Provide 12-inch square samples of sheet materials and 12-inch lengths of trim members for color verification after selections have been made.
- 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 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 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.

1.7 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.

1.8 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:

Platinum Visual Systems™; www.pvsusa.com
Claridge Products and Equipment, Inc.; www.claridgeproducts.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.

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 1450 degrees F.

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, 0.015-inch thick.
- E. Laminating Adhesive: Manufacturer's standard moisture resistant thermoplastic type.

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™, Top Supported Sliding Units THS Series.
 2. Metal trim and accessories: THS Series aluminum extrusions with clear satin anodized finish.
 - a. Top Track GT600: One piece top track with integral fascia.
 - b. Bottom Track and Chalktray BT650: One piece bottom track with integral chalktray and ribbed section with 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 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.
 4. 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.
 5. Fixed Back Markerboard Panel.
 6. Size: As shown on drawings.
 7. Color: White.

2.5 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.

2.6 FABRICATION

- A. 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.

2.7 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.

2.8 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, prefit 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

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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 2019 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 2019 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
Cryo 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

01/22/20

SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Volleyball floor sleeves.
2. Badminton floor sleeves.

B. Related Sections:

1. Section 09 64 66.51 "Athletic Maple Floor Resurfacing."

1.2 DEFINITIONS

A. NCAA: The National Collegiate Athletic Association.

B. NFHS: National Federation of State High School Associations.

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 Welding Society
ASTM International (ASTM)
National Electrical Manufacturers Association (NEMA)
NCAA: National Collegiate Athletic Association
NFHS: National Federation of State High School Associations

1.4 ACTION SUBMITTALS

- A. Product Data:** Submit list of proposed products and product data.
- B. Shop Drawings:** Submit shop drawings showing list of materials and equipment, sizes, method of construction and operation, installation details, and all other pertinent information.
- C. Submittal procedures and quantities** are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:** Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- B. Sample Warranty:** For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in clean, dry area indoors in accordance with manufacturer's instructions. Keep temporary protective coverings in place.
- C. Protect materials and finish from damage during handling and installation.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 COORDINATION

- A. Coordinate installation of flooring refinishing operation and with court layout and game lines and markers on finish flooring.

1.10 WARRANTY

- A. Provide 1-year warranty against defects in materials and workmanship, unless otherwise specified.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Porter Athletic Equipment Company; www.porterathletic.com (Basis-of-Design).
 - 2. Draper Inc.; www.draperinc.com
 - 3. L. A. Steelcraft Products, Inc.; www.lasteelcraft.com
 - 4. Performance Sports Systems; www.perfsports.com
 - 5. Substitutions: Section 01 25 13 "Product Options and Substitutions."

2.2 VOLLEYBALL EQUIPMENT

- A. Volleyball Floor Sleeves and Cover Plates:

1. Brass-plated cover plate shall be 8" in diameter to allow maximum movement of 3-5/8" in floating type floors. Cover plate shall consist of molded plastic recessed mounting flange (8-1/4" diameter), cork gasket, and an 8" diameter brass-plated cover. Cover shall be equipped with a swivel type retainer pin to prevent theft. Special key shall be provided for cover removal.
2. Sleeve assembly shall be 3-3/4" O.D. heavy wall steel tubing extending 9 inches into non-shrink grout footing. Bottom of sleeve shall be capped with a 4" diameter steel disc to provide proper anchorage in footing. Sleeve assembly to be finished in a rust resistant enamel finish.
3. Basis-of-Design product or equal:

Porter Athletic Equipment Co.; No. 00870-200 Gymnasium Floor Sleeve with Brass Cover for 3-1/2" O.D. Volleyball Standards.

2.3 BADMINTON EQUIPMENT

A. Badminton Floor Sleeves and Cover Plates:

1. Brass-plated cover plate shall be 8" in diameter to allow maximum movement of 4-3/4" in floating type floors. Cover plate shall consist of molded plastic recessed mounting flange (8-1/4" diameter), cork gasket, and an 8" diameter brass-plated cover. Cover shall be equipped with a swivel type retainer pin to prevent theft. Special key shall be provided for cover removal.
2. Sleeve assembly shall be 2-7/8" O.D. heavy wall steel tubing extending 9 inches into non-shrink grout footing. Bottom of sleeve shall be capped with a 3" square steel plate to provide proper anchorage in footing. Sleeve assembly to be finished in a rust resistant enamel finish.
3. Basis-of-Design product or equal:

Porter Athletic Equipment Co.; No. 00772-200 Gymnasium Floor Sleeve (2-3/8") with Brass Cover for use in all Existing or Floating Type Wood Floors.

2.4 SHRINKAGE-RESISTANT GROUT

- ### A. Nonmetallic, Shrinkage-Resistant Grout:
- For grout 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. Minimum compressive strength of 7,000 psi in 28 Days. Acceptable products or equal:

Master Builders; MasterFlow 713: High-precision non-shrink mineral-aggregate grout.

PART 3 – EXECUTION

3.1 EXAMINATION

- #### A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance of the Work.
1. Verify critical dimensions.
 2. Examine below finished floor for subfloors and footings.
- #### B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. For installation of floor sleeves made after athletic wood flooring has been refinished, provide protection and exercise care not to damage flooring.

3.3 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- E. Volleyball Sleeves:
 - 1. Before coring holes in existing concrete slab, check for locations of electrical conduit or pipe.
 - 2. Locate and carefully cut 5" diameter holes in existing floating wood floor.
 - 3. Locate and core 5" minimum diameter holes in existing concrete floor slab and grout sleeves in place using non-shrink grout per manufacturer's standard detail.
 - 4. Top of sleeve to installed 1/2" below finished floor elevation.
 - 5. Secure molded plastic recessed mounting flange to (e) wood floor with #8 x 3/4" long flathead screws.
- F. Badminton Sleeves:
 - 1. Before coring holes in existing concrete slab, check for locations of electrical conduit or pipe.
 - 2. Locate and carefully cut 4-1/2" minimum diameter holes in existing floating wood floor.
 - 3. Locate and core 4-1/2" minimum diameter holes in existing concrete floor slab and grout sleeves in place using non-shrink grout per manufacturer's standard detail.
 - 4. Top of sleeve to installed 1/2" below finished floor elevation.
 - 5. Secure molded plastic recessed mounting flange to (e) wood floor with #8 x 3/4" long flathead screws.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

05/08/20

SECTION 11 66 23.13
BASKETBALL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Backboard edge padding at existing backboards.
- 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. NCAA: The National Collegiate Athletic Association.
- B. NFHS: National Federation of State High School Associations.

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)
American Welding Society
ASTM International (ASTM)
National Electrical Manufacturers Association (NEMA)
NCAA: National Collegiate Athletic Association
NFHS: National Federation of State High School Associations

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Submit list of proposed products and product data.
- B. Samples: Submit samples of backboard padding colors for selection by Architect.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's installation instructions.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For basketball equipment to include in operation and maintenance manuals.

1.7 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of basketball equipment that fail in materials or workmanship within specified warranty period.
- C. Warranty Periods: Warranty periods shall be from the date of "Substantial Completion".
 - 1. Backboard bolt-on safety edge padding: 8 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain each type of basketball equipment from single source from single manufacturer.

2.2 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Draper, Inc., www.draperinc.com.
 - 2. Porter Athletic Inc.; www.porterathletic.com
 - 3. Sports Specialties; www.sportsspecialties.com
 - 4. Substitutions: Section 01 25 10 "Product Options and Substitutions."
- B. Basis-of-Design Manufacturer: Draper, Inc.

2.3 BACKBOARD SAFETY EDGE PADDING

- A. Backboard Edge Padding:
 - 1. Basis-of-Design Product: Draper Inc. Model 5032XX bolt-on backboard safety padding.
- B. Type: Foam padding for bottom edge and corners of backboard to provide safety protection to meet NCAA and NFHS requirements.
- C. Construction: Molded foam, 2 inches wide and wrapping around edges 3/4 inch. Equip with molded-in steel track and bolt-on attachment system. Padding shall cover bottom edge of backboard and extend 15 inches up sides.
- D. Color: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Basketball Backstop Safety Edge Padding Installation:

1. Install basketball backstop safety edge padding in accordance with manufacturer's instructions.

3.2 CLEANING

- A. Remove protective wrappings, and wash surfaces.

END OF SECTION

05/01/20

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 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
2. 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. Skyco Shading Systems, Inc.; www.skycoshade.com
 4. Draper, Inc.; www.draperinc.com
 5. 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 802 EnviroScreen *California Edition* – Optimum, semi-transparent metallised fabric. Fabric is woven in a new screen-like construction 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: 100% Inherent FR Polyester.
 - 3) Weight per m²: 220 gm/ m².
 - 4) Thickness: 0.46 mm.
 - 5) Openness Factor: 1%
 - 6) IR Emissivity Factor: 1%
 - 7) Width: 75"/94".
 - 8) Color Fastness ISO105-B02; Interior ≥ 5; Exterior: 8
 - 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) EN13501 B-s1, d0
 - b) DIN4102 B1, BS 5867 part 2 type B
 - c) NFPA 701.
 - d) AS/NZS 1530.3 (0-0-0-1)
 - 12) Environmental: Cradle to Cradle (C2C) Bronze, OEKO-TEX Standard 100 Class IV; HPDD2.1; RoHS2, REACH, GreenGuard (LEED); Greenguard Gold; Ecospecifier; Formaldehyde free; Hologen free; Phthalate free; Antimicrobials free.
 - 13) Technical Performance:
 - a) Fabric Color Code: (000); To be selected by Architect.
 - b) Solar Transmission: 3% to 4%, depending on color selection.
 - c) Solar Reflection Outside: 74%.
 - d) Light Transmission: 2% to 4%, depending on color selection.
 - e) Light Reflection: 64%.
 - f) UV Transmission: 2%.
 - g) IR Emissivity of metal side: 0.19.
 - h) Ra (Color rendering index): 97 to 99, depending on color selection.
 - 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

01/22/20

SECTION 12 66 00
TELESCOPING STANDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Electrically operated telescoping stands.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.
- C. Related Sections:
 - 1. Section 02 41 19 – Selective Demolition: Removal of existing bleachers at Building K - Gymnasium.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

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 telescoping stands.
 - 2. Include load capacities, assembly characteristics, and furnished accessories.
 - 3. Include electrical characteristics of electrical components, devices, and accessories.
- B. Shop Drawings: For telescoping stands in both stacked and extended positions.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include load capacities.
 - 3. Show seating layout, aisle widths, row-lettering and seat-numbering scheme, and wheelchair accessibility provisions.
 - 4. Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Structural Calculations: Include compliance with current State of California seismic requirements and signed by a Structural Engineer licensed in the State of California. Manufacturer shall have a structural set of drawings on file with all DSA offices. Where more than one PC set of drawings are on file with DSA, provide the premium structural grade bleachers and drawings. Incorporate into the shop drawings all applicable bleacher PC structural approval drawings.
- D. Samples for Initial Selection: For each type of exposed product and for each color and texture required.
 - 1. Include Samples of accessories involving color and finish selection.

- E. Samples for Verification: For the following products prepared on Samples of size indicated below:
 - 1. Decking: 4-inch- square Samples of finished material.
 - 2. Metal Components: 6-inch- square Sample of each color and finish indicated.
 - 3. Seating Material: 6-inch- square Sample of each seating material, color, and finish indicated.
 - 4. Seat: Unit: Plastic chips for each color.

1.4 DIVISION OF STATE ARCHITECT DEFERRED APPROVAL

- A. After Architect and Structural Engineer have reviewed the shop drawings and materials prepared and provided by the Contractor for the Deferred Approval item, Architect will forward those materials to Division of the State Architect (DSA) for their review and comment.
- B. 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.
- C. 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.
- D. 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.
- E. No work shall commence on a Deferred Approval item until all these requirements have been completed.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Product Certificates: For each type of telescoping stand assembly.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - 1. Procedures for conducting periodic inspections.
 - 2. Precautions for cleaning materials and methods that could be detrimental to telescoping-stand finishes and performance.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be regularly engaged in the design and manufacturing of telescopic seating for not less than twenty years.

- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Finished Spaces: Do not deliver or install telescoping stands until finishes in spaces to receive them are complete, including suspended ceilings, floors, and painting.
- B. Field Measurements: Indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of telescoping stands that fail in materials or workmanship within five years for all bleachers and 10 years for understructure.
- B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Telescoping Stands:
 - 1. Irwin Seating Company, VersaTract with Infinity Seats (Basis-of-Design manufacturer/product); www.irwinseating.com.
 - 2. Substitutions require approval 14 days prior to the bid.
- B. Structural Performance: Telescoping stands shall withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.
- C. DSA Approval:
 - 1. Products of other manufacturers may be submitted for approval as equivalent, provided they meet or exceed the requirements of these specifications and have DSA PC Structural approval.
 - 2. Acceptable substitutions shall be submitted to the Division of the State Architect as a Field Change Directive and must be processed on a deferred approval basis. All associated design review; engineering and submittal costs shall be borne by the contractor. No time extensions shall be allowed for FCD/Deferred Approval of this item.
 - 3. Manufacturer to have DSA PC Structural approval for CBC 2019. Submittals and calculations to be stamped by a CA Structural Engineer.

2.2 DESIGN REQUIREMENTS

- A. Provide microphone outlet, spotter system outlet, basketball, volleyball, and wrestling scoreboard outlets in an accessible location.
- B. Provide accessible seating per the seating requirements of CBC Section 11B-221.
- C. The bleacher system shall be comprised of multiple-tiered, closed-deck seating rows operating in a telescopic manner, incorporating the most economical quantity of sections while still complying with all loading requirements.

- D. The first moving row shall be secured with friction or mechanical locks. Other rows shall be mechanically locked, operable only upon unlocking and cycling the first row. All sections and all rows to have right- and left-hand row locks.
- E. Each bleacher row shall be comprised of risers, seat and deck components, and a complete set of supportive columns and braces.
- F. The telescopic bleacher shall incorporate a locking system permitting the use of one, several, or all rows, each locked in the extended position.
- G. Telescopic gymnasium seating shall be designed to support a vertical live load of 100 PSF. Foot and seat boards shall be designed for a 120 PLF live load and, as a separate load case, a 300 LBS concentrated load.
- H. Seating shall also be designed to carry a horizontal sway force of 24 PLF parallel to the seating and 10 PLF perpendicular to the seating.

2.3 TELESCOPING STANDS

- A. System Description: Operable system of multiple-tiered seating on interconnected folding platforms that close for storage, without being dismantled, into a nested stack. Telescoping-stand units permit opening and closing of adjacent, individual and multiple rows, and close with vertical faces of platforms in the same vertical plane.
 - 1. 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. Telescoping-Stands Standard: ICC 300.
- B. Product: VersaTract Telescopic Gym Seat System by Irwin Seating Company; or equal.
 - 1. Model: VersaTract Telescopic Gym Seats.
 - 2. Row spacing to be 25". Rise to be 10".
 - 3. Aisle Type: Foot level aisles, front steps, and intermediate aisle steps.
 - 4. Seat Type, 10" Infinity.
 - 1. Include 15 color options and provide up to 2 colors at no added cost.
 - 2. Supply plastic modular 18" individual seats in 10" deep models. Seating to be scuff resistant injection-molded high-density polyethylene plastic.
 - 3. Seat heights shall be maintained at a minimum of 16-3/4". For options where seat heights are less than 16-3/4" above the deck board provide the next available hi rise option.
 - 4. Foot space shall be maximized for spectator comfort and provide a minimum of 22" when measured with a 10" module.
 - 5. Operation: Electric.
 - 1. Integra Drive System (IDS) shall be furnished on each seating group to open and close the telescopic units. Each individual section shall include 2 IDS friction drive systems integrated into the first moving row of understructure to achieve smooth and efficient operation. Operation of the seating shall be accomplished with the use of a walk along pendant control.
 - 2. Each IDS power system shall include large 6-1/2" diameter friction rollers to develop tractive force adequate to open and close the system. Each roller to include non-marring 1/2" thick rubber covering.
 - 3. Electrical motors for each section shall be heavy-duty and high efficiency gear reduction motors. The shaft diameter for the gear motor and rollers shall be a minimum of 1" and be connected by a 1" diameter schedule 40 drive shaft,
 - 4. All roller chain and sprockets used throughout the drive system shall be a minimum of #40 in size. Each drive unit to have front and rear wheel drive.

- Each drive unit shall be designed to include a safety shroud around the chain and sprocket for overall safety.
5. The power units shall develop tractive forces adequate to operate the seating units under normal conditions but inadequate to operate should significant obstacles be encountered.
 6. All electrical parts and wiring shall be installed in complete accordance with the National Electrical Code. U.L. Listing FHJU.E479554.
 7. Supply power system with 208/230V, 5 wire 3-phase system by Division 26 electrical contractor.

2.4 COMPONENTS

A. Decking:

1. Panelam decking shall have a 0.030-inch (30 thousandths) high density polyethylene overlay, permanently bonded over 5-ply structural plywood in strict compliance with U.S. Product Standard PS-1 requirements. Finish thickness to be 5/8". Plywood shall be supported along the front and back edge for maximum rigidity and designed in a manner that allows 3 plies to run front to back for increased deck strength. Each plywood panel shall be connected using a tongue and groove splice leaving the deck clean and free of any tripping or cleaning obstructions. Decking shall be secured in place by the encapsulation of the rear riser and mechanical fasteners along the front edge. Panelam to be selected from manufacturer's standard colors grey or beige.

B. Wheels:

1. Wheels shall not be less than 5" diameter x 1-3/8" non-marring soft rubber face to protect synthetic floor surfaces.
2. Provide 3 wheels per post, 6 per section. Options with smaller wheels to provide 6 wheels per post, 12 per section.

C. Top Row Section Supports:

1. Provide two unistrut shaped, triple formed, 2"x2", 10 gage cantilever arms welded to the post per section.
2. Where cantilever arms are single or double formed, provide two additional Tuff Deck supports per section to increase resistance to permanent deformation from loading in the unsupported closed position.

D. Row Locks: Provide left-hand and right-hand, low profile, row locks on all sections and all rows.

E. Understructure System:

1. Steel supports and rolling frames shall be constructed from formed steel of the size and shape necessary to support the design loads. All support bracing shall begin at Row 2 and be of diagonal or "knee" type for rigidity. Diagonal bracing to be minimum 1-1/2" x 1-1/2" 14-gauge square tubing.
2. Each fully skirted wheel channel shall be formed 12-gauge steel and continuously in contact with adjacent channels by means of an integral alignment system and include nylon glides to eliminate any metal to metal contact. Wheel channel alignment systems with metal-to-metal contact requiring periodic lubrication or that utilizes a metal-to-metal guide rod system that can be bent or damaged will not be acceptable.
3. Vertical columns shall be high tensile steel structural tube to meet design criteria. Minimum column size to be 2" x 3" 14-gauge structural tube, welded to a 2" wide wheel channel using 360 degrees of weldment.
4. Deck support members shall be double formed 14-gauge steel and connect the front nosing and rear riser members. Each deck support shall include a unique dual-

purpose roller that provides smooth support during operation. The deck support roller shall also include a 3/4" wide shoulder that's encapsulated by the deck support on the row above in order to maintain proper upper alignment while delivering consistent, repeatable operation.

2.5 MATERIALS

- A. Steel components: cold-formed from appropriate width coil conforming to A1011 SS Grade 30, ASTM A653 - Grades 33, 40 and 50, ASTM A500 - Grade B 46 KSI as applicable.
- B. Lumber components: Kiln-dried, finger-jointed, edge-glued southern pine of grade "B & B Finish" manufactured to the current SPIB glued laminated standards for southern pine.
- C. Plywood deck boards: Fabricated from Douglas Fir Premium Underlayment with exterior glue, 5 ply minimum, solid cross band directly under face ply, species Group 1 and manufactured in accordance with APA grade trademarked PS 1.
- D. Molded Plastic: High-density polyethylene; injection molded, color-pigmented, textured, impact-resistant, with integral reinforcing ribs for attachment and anchoring points. Provide with UV inhibitors to retard fading.

2.6 ACCESSORIES

- A. Provide self-storing telescoping end rails.
- B. Smart Rail aisle handrails shall be provided for 25" row spacing. Aisle railings shall quickly and easily rotate 90 degrees to the locked position and store parallel to the front of the aisle. Railings that require removal from the pocket or the use of tools for storage will not be acceptable. Aisle railings shall be an individual rail design, located on every other row starting at row two (2). Railing to be constructed of 1-1/2", 11 gage, round steel tubing, finished in a textured powder coated epoxy.
- C. Provide telescoping end curtains. Vinyl end curtains shall be provided to limit unauthorized access to the underside of the telescopic system. Curtain to be one-piece design shaped to follow the angle of the telescopic unit in the open position and constructed of a sturdy vinyl material with sewn-in grommets for attachment. Color to be selected by Architect from manufacturer's standard selection. Curtains to be solid color with 14 oz. vinyl.
- E. Provide one 18" x 8'-0" scorer's table with folding legs allowing storage within row 1 of the bleachers. Tables requiring storage on top row of the bleachers or in a storage room are not acceptable.

2.7 FABRICATION

- A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.
- B. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- C. Form exposed work with flat, flush surfaces, level and true in line.
- D. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install telescoping stands according to ICC 300 and manufacturer's written instructions.

3.3 ADJUSTING

- A. Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.
- B. Adjust hardware and moving parts to function smoothly, and lubricate, test, and adjust each telescoping stand unit to operate according to manufacturer's written instructions.
- C. Clean installed telescoping stands on exposed and semi-exposed surfaces. Touch up factory-applied finishes or replace components as required to restore damaged or soiled areas.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands.

END OF SECTION

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SECTION 13 31 23

PRE-ENGINEERED FABRIC SHADE STRUCTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Special Conditions, and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

- A. A single, State of California-licensed fabric shade structure contractor shall be responsible for the design, wet-stamped engineering drawings, permitting, fabrication, supply, and erection of the work specified herein, including foundations. The intent of this specification is to have only one shade contractor be responsible for all of the functions listed above.

1.3 SUBMITTALS

- A. Provide proof of existing reference sites with structures of similar project scope and scale, and that are engineered to DSA specifications.
- B. Provide a minimum of 7 fabric samples to demonstrate fabric color range, and a digital (PDF) or paper document showing a minimum of 9 powder coat color choices. Also, provide a letter of authorization from the fabric manufacturer delineating authorized use of the specified fabric.
- C. Provide proof of all quality assurance items, including;
 - 1. A list of at least 3 reference projects in California that have been installed a minimum of 12 years.
 - 2. Proof of General Liability, Professional Liability, and Umbrella insurance, as per paragraph 1.4.D.
 - 3. Proof of current State of California Contractor's License, Class A or Class B.
 - 4. Proof of current Approved Fabricator license.
 - 5. Proof of a minimum of \$6,000,000 aggregate bonding capacity.
 - 6. Proof of current IAS certification, as per paragraph 1.4.F.
 - 7. Proof of an Annual Maintenance Inspection Program.
 - 8. Proof of a Corporate Safety and/or Injury & Illness Prevention Program.
 - 9. Proof of current status as an ISNetwork Member Contractor.

1.4 QUALITY ASSURANCE

- A. Fabrication and erection are limited to firms with proven experience in the design, fabrication, and erection of fabric shade structures, and such firms shall meet the following minimum requirements. No substitutions shall be allowed for the following:

- B. A single shade structure contractor shall design, engineer, manufacture, and erect the fabric shade structures, including the foundations, and shall provide a dedicated Project Manager throughout the entire Scope of Work related to the shade structure(s).
- C. Bidders shall have at least 15 years' experience in the design, engineering, manufacture, and erection of fabric shade structures, engineered to California Building Code requirements with similar scope, and a successful construction record of in-service performance.
- D. Bidders shall provide proof with bid submittal of a minimum of \$1,000,000 General/Public Liability insurance, \$3,000,000 Professional Liability (PL) insurance, and additional \$5,000,000 Umbrella/Excess Liability insurance.
- E. Bidders shall be a currently licensed contractor in the State of California, and shall provide proof of a minimum aggregate bonding capacity of \$6,000,000 with bid.
- F. Manufacturer shall have an Approved Fabricator license and be accredited by the IAS (International Accreditation Service) for Structural Steel Fabrication under CBC 2016, Section 1704A.2.5.1.
- G. The fabric shade structure contractor shall have a Corporate Quality Control program (manual), which describes their complete quality assurance program.
- H. Bidders must be a current Member Contractor with ISNetworld, which confirms the bidder's strict adherence to Safety, Insurance, Quality, and Regulatory standards.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fabric shade structure(s) shown on the drawings in relation to the property survey and existing structures, and verify locations by field measurements prior to erection of the fabric shade structure(s).

1.6 WARRANTY

- A. The successful bidder shall provide a 12-month warranty on all labor and materials.
- B. A supplemental warranty from the manufacturer shall be provided for a period of 10 years (pro-rated) on fabric and 10 years on the structural integrity of the steel, from date of substantial completion.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents, and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The structures shall consist of three (3) DSA 1032020-16, 20' x 20' x 12' Single Post Pyramid Unit Shade Structures.
 - 1. Color:
 - a. Shade color: Blue Standard Colourshade FR Fabric (DSA Approved).
 - b. Posts and Frame color: Tele-Gray 115892 Powdercoating.
 - 2. Mounting per DSA-approved structural drawing.

3. Structural columns shall be a minimum of HSS 8.625 X 0.322 for the Shade Structure.
- B. The structures shall be manufactured by Shade Structures, Inc., d/b/a USA SHADE & Fabric Structures, or approved equal with valid PC at time of bid that includes the engineering drawings, fabric roof, steel cables, all fasteners, and erection of structure(s), including foundations.
- C. Contact: USA SHADE & Fabric Structures
1085 N. Main Street, Suite C
Orange, CA 92867
Phone: 408.478.1646 Fax: 714.538.2440
Attn: Erik Anslinger
ean sling er@usa-shade.com
- D. To qualify as an approved equal, please submit product documentation, fabric samples, and all quality assurance criteria, as per Article 1.4, at least 10 days prior to bid in order to be considered. No substitutions will be allowed after the deadline. Any approval of alternate manufacturers shall be by addendum prior to the bid date and shall not be allowed without written notification.
- E. The fabric shade structure(s) shall conform to the current adopted version of the California Building Code 2016.
- F. Fabric shade structures are designed and engineered to meet the minimum of 110mph Wind Load, Risk Category II, Exposure C, and Seismic (earthquake) Load based on Seismic Design Category D, Seismic Risk Category II, and a Live Load of 5psf. Fabric shade structures shall be engineered with a zero wind pass-through factor on the fabric. When ASD Steel Design Method is used based on CBC 2016 Section 1605A.3.1, the load combinations Dead Load + 0.75 Live load + 0.75 Wind Load, and 0.6 Dead Load + Wind Load must be analyzed. NO EXCEPTIONS.
- G. Steel:
1. Steel members of the fabric shade structure shall be designed in strict accordance with the requirements of the "American Institute of Steel Construction" (AISC) Specifications and the "American Iron and Steel Institute" (AISI) Specifications for Cold-Formed Members and manufactured in a IAS- (International Accreditation Service) accredited facility for Structural Steel Fabrication under CBC 2016 Section 1704A.2.5.1.
 2. Connections shall have a maximum internal sleeving tolerance of 0.0625" using high-tensile strength steel sections with a minimum sleeve length of 6".
 3. Non-hollow structural steel members shall comply to ASTM A-36. Hollow structural steel members shall be cold-formed, high-strength steel and comply with ASTM A-500, Grade C. Steel plates shall comply with ASTM A-572, Grade 50. galvanized steel tubing shall be triple-coated for rust protection using an in-line electroplating coat process. Galvanized steel tubing shall be internally coated with zinc and organic coatings to prevent corrosion.
- H. Bolts:
1. Structural field connections of the shade structure shall be designed and made with high-strength bolted connections using ASTM A-325, Grade B or SAE J249, Grade 8.
 2. Where applicable, stainless steel bolts shall comply with ASTM F-593, Alloy Group 1 or 2. Bolt fittings shall include rubber washers for water-tight seal at the joints. Nuts shall comply with ASTM F-594, Alloy Group 1 or 2.
- I. Welding:

1. Shop-welded connections of the fabric shade structure shall be designed and performed in strict accordance with the requirements of the "American Welding Society" (AWS) Specifications. Structural welds shall be made in compliance with the requirements of the "pre-qualified" welded joints, where applicable and by certified welders. No onsite or field welding shall be permitted.
2. Full penetration welds shall be continuously inspected by an independent inspection agency and shall be tested to the requirement of 2016 CBC.

J. Powder Coating:

1. Galvanized steel tubing preparation prior to powder coating shall be executed in accordance with solvent cleaning SSPC-SP1. Solvents such as water, mineral spirits, xylol, and toluol, which are to be used to remove foreign matter from the surface. A mechanical method prior to solvent cleaning, and prior to surface preparation, shall be executed according to Power Tool Cleaning SSPC-SP3, utilizing wire brushes, abrasive wheels, needle gun, etc.
2. Carbon structural steel tubing preparation prior to powder coating shall be executed in accordance with commercial blast cleaning SSPC-SP6 or NACE #3. A commercial blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, mill scale, rust, coating, oxides, corrosion, and other foreign material.
3. Powder coating shall be sufficiently applied (minimum 3 mils thickness) and cured at the recommended temperature to provide proper adhesion and stability to meet salt spray and adhesion tests, as defined by the American Society of Testing Materials. Standard color, Tele-Gray.
4. Raw powder used in the powder coat process shall have the following characteristics:
 - a. Specific gravity: 1.68 +/- 0.05
 - b. Theoretical coverage: 114 +/- 4ft²/mil
 - c. Mass loss during cure: <1%
 - d. Maximum storage temperature: 80 deg F
 - e. Interpon® 800 is a high-durability TGIC powder coating designed for exterior exposure. Tested against the most severe specifications, Interpon® 800 gives significantly improved gloss retention and resistance to color change.
5. When the fabric shade structure(s) will be located within 15 miles of the ocean or standing body of water, rust protection undercoat primer will be required on all structures. Sherwin-Williams® POWDURA® epoxy powder coating Z.R Primer shall be applied in accordance with the manufacturer's specifications. Primer should be fused only and then top coated with the selected powder coat to ensure proper inter-coat adhesion.
 - a. The primer's attributes shall be:
 - 1) Specific gravity (g/ml): 2.37
 - 2) Coverage at 1.0 mil (ft²/lb): 81.6
 - 3) Adhesion: ASTM D-3359: 5B
 - 4) Flexibility: ASTM D-552: Pass 1/8"
 - 5) Pencil hardness: ASTM D-3363: H-2H
 - 6) Impact resistance (in.lb): ASTM D-2794: Dir & Rev, 120 in-lbs
 - 7) Salt spray resistance: ASTM B-117: 2000 hours
 - 8) Humidity resistance: ASTM D-4585: 2000 hours
 - 9) 60° Gloss: ASTM D-523: 50 ~ 70
 - 10) Cure schedule (metal temp): 10min @ 390 deg F 25min @ 275 deg F.

11) Film thickness tange (mils): 2.0 ~ 3.0

K. Tension Cable: Steel cable is determined based on calculated engineering loads.

1. For light and medium loads, 0.25" (nominal) galvanized 7x19 strand cable shall be used.
2. For heavy loads, and depending on structural size, either 0.375" (nominal) or 0.5" (nominal) galvanized 7x19 strand cable shall be used.

L. Fabric Roof Systems:

1. UV Shade Fabric:

a. Colourshade® FR UV shade fabric is made of a UV-stabilized, high-density polyethylene (HDPE), as manufactured by Multiknit® (Pty) Ltd. HDPE mesh shall be a heat-stentered, three bar Rachel-knitted, lockstitch fabric with one monofilament and two tape yarns to ensure that the material will not unravel if cut. Raw fabric rolls shall be 9.8425 feet wide.

b. Fabric Properties:

- 1) Life Expectancy: Minimum 8 years with continuous exposure to the sun
- 2) Fading: Minimum fading after 5 years (3 years for Red)
- 3) Fabric Mass: 5.31 oz/yd² ~ 5.6 oz/yd².
- 4) Fabric Width: 9.8425 feet.
- 5) Roll Length: 164.04 feet.
- 6) Roll Dimensions: 62.99 inches x 16.5354 inches.
- 7) Roll Weight: +/- 66 lbs.
- 8) Minimum Temp: -13 deg F.
- 9) Maximum Temp: +176 deg F.

c. Fabric shall meet the following flame spread and fire propagation tests:

- 1) ASTM E-84
- 2) NFPA 701 Test Method 2
- 3) California's Office of the State Fire Marshal, Registered Flame Resistant Product

2. Stitching and Thread:

a. Sewing seams are to be double-stitched.

b. The thread shall be GORE® TENARA® mildew-resistant sewing thread, manufactured from 100% expanded PTFE (Teflon™). Thread shall meet or exceed the following:

- 1) Flexible temperature range.
- 2) Very low shrinkage factor.
- 3) Extremely high strength, durable in outdoor climates.
- 4) Resists flex and abrasion of fabric.
- 5) Unaffected by cleaning agents, acid rain, mildew, salt water, and is unaffected by most industrial pollutants.
- 6) Treated for prolonged exposure to the sun.
- 7) Rot resistant.

3. Shade and UV Factors:

a. Shade protection and UV screen protection factors shall be as follows:

Color	UV Block	Shade Factor
Blue	85%	80%

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation of fabric shade structures shall be performed by manufacturer or manufacturer-approved contractor, which shall be bonded and holding a current contractor's license with the State of California's Contractors State License Board. Installation personnel must have experience in the erection of tensioned fabric structures.

B. The installation shall comply with the manufacturer's instructions for assembly, installation and erection, per approved drawings.

C. Concrete:

1. Unless noted otherwise for footings and piers by the Project Engineer, the concrete specification for footings and/or piers shall meet a minimum 4,500 psi at 28-day strength.
2. Concrete work shall be executed in accordance with the latest edition of American Concrete Building Code ACI 318-14.
3. Concrete specifications shall comply in accordance with the specifications on Drawing DSA-1032020-16, Sheet 16.1-1000, detailed as per plans, and shall be as follows:
 - a. 28 Days Strength $F'_c = 4,500$ psi.
 - b. Aggregate: HR.
 - c. Slump: 3 ~ 5 inch.
 - d. Portland Cement shall conform to C-150.
 - e. Aggregate shall conform to ASTM C-33.
4. Reinforcement shall conform to ASTM A-615 grade 60.
5. Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual and Manual of Standard Practice.
6. Whenever daily ambient temperatures are below 80 degrees Fahrenheit, the contractor may have mix accelerators and hot water added at the batch plant (See Table 1).
7. The contractor shall not pour any concrete when the daily ambient temperature is to be below 55 degrees Fahrenheit.

TABLE 1

Temperature Range	% Accelerator	Type Accelerator
75~80 degrees F	1% High Early	(non calcium)
70~75 degrees F	2% High Early	(non calcium)
Below 70 degrees F	3% High Early	(non calcium)

D. Foundations:

1. Anchor bolts set in new concrete shall comply with ASTM A-325, Type 1.
2. Anchor bolts shall be Hot-Dip Galvanized.

3. Footings and full rebar cages shall be drilled, set, and poured as per manufacturer's specifications. These fabric shade structures are to have minimum footings of 24" diameter x 9'-6" for the Shade Structure with full rebar cage, as per final approved manufacturer's engineered specifications and drawings.

END OF SECTION

05/01/20

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 09 91 00, Painting.
- D. 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 National Standards Institute (ANSI)
 2. Adhesive and Sealant Council (ASC)
 3. American Society of Mechanical Engineers (ASME)
 4. American Society for Testing and Materials (ASTM)
 5. American Society of Civil Engineers (ASCE)
 6. California Building Code (CBC)
 7. California Plumbing Code (CPC)
 8. California Fire Code (CFC)
 9. California Energy Conservation Code, Title 24
 10. State of California Administrative Code (CAC) Titles 8, 17, and 24
 11. California Electric Code (CEC)
 12. National Electrical Manufacturers Association (NEMA)
 13. National Fire Protection Agency (NFPA)
 14. Underwriters' Laboratories (UL)
 15. Comply with all ADA and California Title 24 requirements for disabled access.
 16. Division of State Architect, State of California (DSA)

17. City Fire Marshal requirements
 18. 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. Verify that utility company's size their services and meters to suit ultimate demand indicated on the drawings.
- C. 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.
- D. 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.

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.
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- 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.
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- 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.
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- 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 01600 Product Requirements 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. Drains, Cleanouts and Vent Caps.
11. Access Doors.
12. Pipe and equipment markers, and valve tags.
13. Flexible Connectors and Seismic Joints.
14. Plumbing Fixtures and Trim.

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 01720 Project Record Drawings and Section 01725 Electronic Documentation of Project.

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 MAINTENANCE MATERIAL SUBMITTALS

- A. 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.

1.20 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: 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. 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. 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.
10. Provide Schedule 40 red brass nipples at copper lines serving fixtures. Galvanized nipples are not allowed.
11. 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.

12. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
13. Accessible Fixtures
 - a. All exposed 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 WASTE & VENT PIPING SYSTEMS

- A. Above 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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. 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.
- F. All insulation shall be continuous through walls, sleeves, pipe supports and hangers, and other pipe penetrations.
- G. Finish insulation at supports, protrusions and interruptions. No hangers or supports shall be embedded in insulation.
- H. 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.
- I. 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.

2.7 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. Adjustcrete, 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 07270, Fire Stopping and Smoke Seals**. 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:
- Smooth up rough edges around sleeve with plaster.
 - 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.

2.8 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
Sanitary Sewer	Green	White
Sanitary Vent	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.

2.9 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 07270, Fire Stopping and Smoke Seals.
- 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 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.

3.4 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.

3.5 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 07900, 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. 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.

3.6 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. Apply tests for a minimum period of four (4) hours or tests are complete.
- K. 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.
- L. Furnish all labor and all other utilities required to make tests. Make compliance tests in the presence of the Owner's Representative.
- M. 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.

3.7 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 ($\frac{3}{4}$ ") 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.

3.8 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.

3.9 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.

3.10 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.

3.11 CLOSING IN OF UNINSPECTED WORK

- A. Do not allow or cause any to be covered up or enclosed until inspected, tested and approved.

3.12 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.

3.13 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.

3.14 PRELIMINARY OPERATIONS

- A. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

3.15 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

05/01/20

SECTION 23 05 00

GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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).

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.
- 1.11 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.
- 1.12 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.

1.13 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.

1.14 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.

1.15 TESTING

- A. Provide tests specified hereinafter, where applicable. Provide written verification that the tests have been successfully completed.

1.16 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.

1.17 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.

1.18 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.

1.19 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

2.1 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 01630 – Product Substitution Procedures.

2.2 VALVES

- A. For Domestic Water Service refer to specification Section 22 00 00 Plumbing.

2.3 HANGERS AND SUPPORTS

- A. All required seismic bracing shall be installed as per Title 24, Part 2, 2019 CBC for total lateral forces prescribed in ASCE 7-16.
- 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"
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.

2.4 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.

2.5 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.

2.6 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 M-001
- 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 M-001
 - 2. The bracing and attachments to the structure shall comply with one of the OSPD Pre-Approvals with OPM#, such as B-Line (OPM 0114-13), Mason Industries (OPM 0043-13), M.S. Sausse & CO, Inc. (OPM 0203-13) as modified to satisfy anchorage requirements of ACI 318 Chapter 17.
 - 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

2.7 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 2½" or smaller.
 - 5. Provide at each end of each marker Brady or equal 2¼" 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.

2.8 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.

2.9 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.

2.10 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

3.1 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.

3.2 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.

3.3 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.

3.4 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.

3.5 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 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.

3.6 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. of 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.

3.7 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
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.

3.8 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.

3.9 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.

3.10 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.

3.11 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.

3.12 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.

3.13 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

05/01/20

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

01/22/20

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 31 00, DUCTWORK AND ACCESSORIES

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. "2-2.1.2(a) All materials exposed to the air flow shall have smoke developed ratings not greater than 50 and be non-combustible or limited combustible."
 - 3. "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

2.4 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: 1½" 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. 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.
- D. 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 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.

3.4 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

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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. Turning vanes.
 - 4. Flexible ducts.
 - 5. Duct accessory hardware.
 - 6. Duct Adhesives, Sealants, and Caulks
 - 7. Duct Cleaning.

1.3 SUBMITTALS

- A. Product data for the following:
 - 1. Volume dampers.
 - 2. Turning Vanes.
 - 3. Flexible ducts.
 - 4. 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 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.

2.4 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. METALAIRE, Inc.
- C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
 - 1. Airsan Acoustiturn or equal.

2.5 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.

2.6 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.

2.7 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 23 05 93 Testing, Adjusting, and Balancing."

3.5 DUCTWORK AND ACCESSORIES

- A. Fabricate and support in accordance with 2019 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	Spiral Seam
			Ga.	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
		$60 < D \leq 84$	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 3/4" 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 & 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 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

3.7 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.

3.8 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

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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 Section, 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 31 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, SUBMITTALS.
- 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. ASCE 7-16 - Minimum Design Loads for Buildings and Other Structures.

- D. American Society for Testing and Materials (ASTM International):
 - 1. A653-19a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process.
 - 2. A1011-18a - Standard Specification for Steel Sheet and Strip Hot rolled Carbon structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.
 - 3. B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 4. E84-20 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. National Fire Protection Association (NFPA):
 - 1. 90A-18 - Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 2. 96-17 - Ventilation Control and Fire Protection of Commercial Cooking Operations.
- F. Underwriters Laboratories, Inc. (UL):
 - 1. 33-10 - 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: lay-in ceiling mount, off-white finish, and round connection as shown on the drawings.
 - a. Face type: Louvered, 4-way directional pattern.
- D. Return or Exhaust Diffuser: lay-in ceiling mount, off-white finish, and round connection as shown on the drawings.
 - 1. Finish: Off-white baked enamel for ceiling mounted units.
 - 2. Perforated Face Type.
 - 3. Lay-in ceiling.

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

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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.

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 Section 32 13 13 "Landscape Site 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 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 "Through-Penetration Firestop Systems."

3.6 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.

3.7 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

05/01/20

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 "Through-Penetration Firestop Systems."

- 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

01/22/20

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

01/22/20

SECTION 26 05 48

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 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. B-Line Tolco
 - 2. Erico, Inc.
 - 3. ISAT
 - 4. Mason Industries, Inc,

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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SECTION 26 05 33

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - A. 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:
 - i) Temporary schedules: schedules that execute on an assigned day then automatically delete themselves from memory.

- ii) 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 16 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 "Identification for Electrical Systems."

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 "Closeout Procedures - Demonstration and Training."

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 "Identification for Electrical Systems."
 - 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 79-19 - 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.

2.10 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.

2.11 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 25-2.13 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

01/22/20

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 79-19 - 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

01/22/20

SECTION 31 10 00

SITE PREPARATION AND 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.
- E. Preserve and protect existing trees, shrubs and other improvements and adjoining properties during removal work, site preparation work and construction.
- F. Generally, this project includes construction of new courtyard 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 re-installed.
 - 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 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 if permission is granted from the Owner's Representative per the Districts Integrated Pest Management Plan.
 - 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 base rock.
 - 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

01/23/20

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 REFERENCES

- 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 regulations required by the State of California.
- C. Comply with 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.
- B. This report is available 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 to 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 Inspection 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 the 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 said data, which is offered solely for the convenience of the Contractor.
- M. Control of Water: Take measures as may be required to 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" 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 as a week and grass killer that is quick acting, short lived, non-selective, 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 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 no cover or enclose work of this Section before obtaining required inspections, tests and 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 an 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.
 - 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 over-excavation to proper grades. Fill over-excavation 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 boulder 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 satisfactory.
 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 obtain 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 disturbed 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 2000 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, field tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or removed 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 excess 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

01/23/20

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.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Select Bedding Sand: Class A screened fill sand with a maximum particle size of 1/2", not exceeding 19 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 50 percent of 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

01/23/20

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. Section 32 12 16 – 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.

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 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 ¾-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. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
2. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
3. 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

01/23/20

SECTION 32 12 16

ASPHALT PAVING AND SURFACING

PART – GENERAL

1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site 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.
 - 2. Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM International):
 - 1. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 2. ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - 3. ASTM D5035 - 11(2019) - 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 (CalTrans):
 - 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. Asphalt Paving: The Contractor shall furnish material test reports showing compliance with the respective specifications. The Test Engineer may determine to compliance with specifications.
- D. 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. Walks and Paths: Concrete exterior slabs (walks, terraces, etc.) shall have a pitch of at least 2 percent. (unless otherwise noted on the drawings)
- C. Pavement Markings: All traffic control striping and pavement markings shall conform to the standards illustrated in the CalTrans Standard Plans Book current edition.

PART 2 - PRODUCTS

2.1 PAVING MATERIALS

- A. Aggregate Base: 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 CalTrans 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 CalTrans Standard Specifications.

2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the CalTrans 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 CalTrans Standard Specifications.
- C. Pavement Reinforcement Fabric: 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 CalTrans 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 CalTrans 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 CalTrans Standard Specifications.
3. Perform spreading and compacting of asphalt concrete in accordance with Section 39 of the CalTrans 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 CalTrans 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.
 4. Conforms shall form a smooth, pond free transition between exiting and new pavement.
 5. 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

01/23/20

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. Seat walls.
 - 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, 2019 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 of 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 of 3,000 psi minimum.
 - 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 CBC Section 1905A.1.15; ACI 318-14 Section 26.12. During placement perform slump test and air content tests and determine temperature of concrete, per Table 1705A.3, item 6; ACI 318-14 Sections 26.5 and 26.12.
 - 6. Ensure 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 CBC Table 1705A.3, Item 5, Section 1905A.1.

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; or equal. Color(s) shall be as follows:
 - 1. Color A: Mesa Beige C-12, L.M. Scofield, colorant per manufacturer's recommended dosage per 94 lb. sack of cement.
 - 2. Color B: French Gray, C-14, L.M. Scofield, colorant per manufacturer's recommended dosage per 94 lb. sack of cement.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. Expansion Joint Material:
 - 1. Fiber Expansion Joint: A non-extruding resilient filler, saturated with high quality bituminous materials having preserving characteristics. Conform to ASTM-D1751-18.
- 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.
- J. Top Surface Retarder for Finishing Concrete: Topcast Sandblast 05 available from Grace Construction Products, or approved equal. Installed per manufacturer's recommendations including curing prior to application.

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.
- 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 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.

3.9 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.

3.10 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.

3.11 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.

3.12 CLEANUP

- A. Cleanup: Per Section 01 74 19 and Section 01 77 00.

END OF SECTION

05/08/20

SECTION 32 33 00

SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide and install all site furnishings identified in these specifications or shown on the drawings.
- B. Related Documents: Drawings and general provisions of the Contract, including General Conditions and Special Conditions, and Division 10 Specification Sections, apply to this section.

1.2 SUBMITTALS

- A. Submit complete manufacturer's information, including color and material charts, catalog cuts, installation procedures and diagrams, maintenance instructions, etc. Provide three copies to the District. Should it be necessary to propose equipment other than that specified, submit complete manufacturer's information including color and material charts, catalog cuts, installation procedures and diagrams, maintenance instructions, etc.

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 MATERIALS The following products shall be as specified on the drawings:

- A. Tables:
 - 1. Manufacturer: DuMor, Inc., Representative Jon Bawden, Ross Recreation, Inc., 707-736-6890
 - 2. Standard Table (4 total): Model: 298-60TX,. Installation: embed mount. Color: Standard Argento powder-coated finish with Cedar wood grain recycled plastic slats.
 - 3. ADA Table (2 total): Model: 298-60-2TX Standard Table (4 total): Model: 298-60TX,. Installation: embed mount. Color: Standard Argento powder-coated finish with Cedar wood grain recycled plastic slats.
- B. Trash/Recycling Receptacle:
 - 1. Manufacturer: DuMor, Inc., Representative Jon Bawden, Ross Recreation, Inc., 707-736-6890

2. Trash receptacle (4 total): 286-32SH, 32 gallon steel receptacle with shield, top deposit, side opening with liner insert, Argento standard color powder coated finish. Recycle - 434-72, 72-gallon recycling unit, top deposit, 3 stream, double side opening with 3 liner inserts and colored tops, Argento standard color powder coated finish. Color: Standard argento.
 3. Recycling receptacle (4 total): 434-72, 72 gallon recycling unit, top deposit, 3 stream, doubled side opening with liner insert and colored tops. Color: Standard argento.
- C. Skateboard Deterrents:
1. Manufacturer: Grind To A Halt, <https://www.grindtoahalt.com/> , PO Box 221 | Elburn, IL 60119. P 630.365.2375, F 630.365.1075
 2. Model: GrinderMinder. Finish: Solid Stainless Steel with a brushed finish.
- D. Tree Grates:
1. Manufacturer: Urban Accessories, Contact: (877) 487-0488.
 2. Model: Flat Rainbow. Material: Cast Iron. 5' round. Install flush to surrounding paving, per manufacturer's specifications.

PART 3 – EXECUTION

3.1 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 District 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 TRASH/RECYCLING RECEPTACLES

- A. Install trash and recycle receptacles in concrete footings per manufacturer's directions. Install surface mount within thickened concrete section site paving, flush with surrounding grade. Set tops of trash and recycle receptacles level.

3.4 BENCHES

- A. Install in concrete footings per manufacturer's specifications and recommendations. Hold top of footings below finished concrete paving to allow for 5" cover over concrete footing so that top of footings are below concrete paving, flush with surround paving grades. Set tables level.

3.5 SKATEBOARD DETERRENTS

- A. Install GrinderMinder units in concrete walls per manufacturer's directions. Set GrinderMinder units 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.

END OF SECTION

05/07/20

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 93 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 Electric 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 of Testing Materials (ASTM).
- 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 and as outlined herein.

- 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. Coordinate work schedule with Owner to avoid disruption of landscape maintenance of existing landscaping.
 - 4. Install piping prior to soil preparation (planting soil amendment installation).

1.7 WARRANTY, PER SECTION 01 78 36.

- A. 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.
- B. Include a copy of the warranty form in the Operation and Maintenance Manual.

1.8 OPERATION

- A. Routine: Inspect and adjust all heads and control valves including raising or lowering of spray head heights to accommodate plant growth and weather conditions. Check to insure in-line underground drip is operating to keep grass in thriving condition.
- 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: As shown on Drawings and with the following minimum requirements:

- A. 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.
- B. 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.
- C. Shall have removable valve seat so valve can be repaired without removal from irrigation line.
- D. Shall have ability to operate manually without the use of wrenches or special keys.
- E. Shall have one-piece solenoid that attaches directly to valve without shunts or clips that can be lost.
- F. 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".
- B. 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.
- C. 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.
- D. Locate the identification in center of the lid. Provide separate box for each valve.
- E. 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): As shown on Drawings and with the following minimum requirements:

- A. 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.
- B. Shall have the ability to start a programmed sequence of valves a minimum of 5 times a day per program.
- C. 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 BUBBLER HEADS

- A. As shown on drawings

2.9 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.

2.10 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.

2.11 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.

2.12 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.

2.13 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.

2.14 SWING JOINTS

- A. 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.

2.15 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.

2.16 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.

2.17 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.

2.18 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.

2.19 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.
 - 4. Laying of Pipe:
 - a. 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.
 - b. 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.
 - c. 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. Bubblers:

1. 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 74 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

01/23/20

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 of 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.

1.4 SUBMITTALS: Submit two weeks after award of contract or as noted.

- A. Procedures: In accordance with Section 01 33 00 and as specified herein.
- 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, trees in grates.
 5. Root Guard.
 6. Iron Sulfate.
 7. Filter Fabric.
 8. Perforated Drain Pipe.
 9. Header Board.
- 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.
- 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.

1.5 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.

1.6 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.

1.7 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.

1.8 WARRANTIES AND REPLACEMENT

- A. Pre-Emergence Weed Killer: Warrant the work against weed growth for a period of four (4) months after application. Use only if acceptable to the District under their Integrated Pest Management Plan.
- 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:
 - 1. Type A: 6% Nitrogen, 20% Phosphorus Acid and 20% Potash, (6-20-20).
 - 2. Type B: 21 gram planting tablets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Agriform.
 - 3. 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:

<u>Percent Passing</u>	<u>Sieve</u>	<u>Designation</u>
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

- B. 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
- C. Fir and/or Pine Sawdust:
 - 1. Dry bulk density: 450-580 lbs. per cu. yd.

2. Nitrogen content - dry weight basis, 0.5% minimum
- D. Salinity (ECe): 4.0 maximum.
- E. Organic Content: 90% minimum.
- F. Reaction (pH): 4.0 minimum/
- G. 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.
- H. COMPOSTED YARD WASTE AMENDMENT:
 1. The above Ground Redwood or Ground Fir Bark or Ground Pine Bark (ORGANIC AMENDMENT FOR IN SITU SOILS) is the specified organic amendment material required. Acceptance of Composted Yard Waste Amendment in lieu of the above specified ORGANIC AMENDMENT FOR IN SITU SOILS (ON-GRADE) material will be considered if the in situ planting soil salinity and soil structure is favorable for the inclusion of recycled yard waste organic matter, as approved by the Landscape Architect. It is the Contractor's responsibility to secure test samples of both the planting soil and the proposed composted yard waste amendment (2 quart samples) and submit to Soils and Plant Laboratory for evaluation and recommendations per code A05-1 for the soil sample and A91-0 for the amendment sample. The composted yard waste amendment sample shall be a grab sample from the currently available material.
 2. Based on the Soils and Plant Laboratory evaluation, the addition of composted yard waste amendment shall not be acceptable if it creates a leaching requirement. The addition of the compost shall result in a final ECe of the amended soil of less than 4.0 dS/m @ 25 degrees C. as determined in a saturation extract. Use the following table to determine the maximum allowable Ece (dS/m of saturation extract) of compost at desired use rate and allowable Ece increase.

DESIRED USE RATE		MAXIMUM ALLOWABLE Ece INCREASE FROM AMENDMENT		
Cu. Yds. Amendment Per 1000 Sq. Ft. for Incorporation to 6" depth	Volume percentage of amendment	1 dS/m	2 dS/m	3 dS/m
		Maximum ECe of Compost		
1	5	14	28	42
2	11	7	14	21
3	16	5	9.5	14
4	22	3.5	7	10.5
5	27	3	5.5	8.5
6	32	2.5	4.5	7

Example: Specification calls for 6 cu. Yrds. Compost per 1000 sq. ft. for incorporation to 6" depth, and site soil has an ECe of 2.0. In order to avoid exceeding ECe of 4 in final blend, compost ECe shall be less than 4.5 dS/m.

3. Composted Yard Waste Soil Amendment properties as follows:

- a. Gradation:

<u>Percent Passing by weight</u>	<u>Sieve</u>	<u>Designation</u>
90		1/2"
85-100	9.51 mm	3/8"
50-80	2.38 mm	No. 8 8 mesh
0-40	500 micron	No. 35 32 mesh

- b. Organic Content: Minimum 50% based on dry weight and determined by ash method. Minimum 250 lbs. organic matter per cubic yard of compost.
 - c. Carbon to nitrogen ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized.
 - d. pH: 5.5 – 8.0 as determined in saturated paste.
 - e. Soluble Salts: See B. above.
 - f. Moisture Content: 35-60%.
 - g. Contaminants: The compost shall be free of contaminants such as glass, metal and visible plastic.
 - h. Maturity: Physical characteristics suggestive of maturity include:
 - a. Color: Dark brown to black.
 - b. Acceptable Odor: None, soil-like, musty or moldy.
 - c. Unacceptable Odor: Sour, ammonia or putrid.
 - d. Particle Characterization: Identifiable wood pieces are acceptable but the balance of the material shall be soil-like without recognizable grass or leaves.
4. Submit planting soil and composted yard waste amendment samples along with laboratory report from Soils and Plant Laboratory for degree of compliance as specified above to the Landscape Architect a minimum of 3 weeks prior to beginning soil prep. The laboratory report shall include recommendations for adjusting fertilizer and amendment quantities. Upon approval of the Laboratory's report by the Landscape Architect, the recommendations in the report shall become a part of the Specifications and the quantities of soil amendment and fertilizer shall be adjusted to conform with the report at no additional cost to the owner.

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
- B. Mix the iron, amendment and soil thoroughly.

2.7 SOIL SULFUR

- A. Soil Sulfer: 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. 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 linear barrier for use along edged of pavement and 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. 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. 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. 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 used in subsurface drain installations to be Class 2 permeable material in conformance with Section 68 "Subsurface Drains" of the Standard Specifications.

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:
 - 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.
 - 5. 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.
- K. 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.
- L. 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.
- C. Tree And Shrub Planting:
 - 1. 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.
 - 2. 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.
- D. 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"

- E. Break and loosen the sides and bottom of the pit to ensure root penetration. Square off the sides of the plant pits to discourage roots from spiraling around the circular plant pit. 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.
- F. 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
- G. 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.
- H. 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.
- I. Build 6" high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in turf areas.
- J. 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.
- K. 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. 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 for use and apply in compliance with the District's Integrated Pest Management Policy.

3.8 GROUND COVER PLANTING

- A. 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 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. 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. 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

01/23/20

SECTION 33 10 00

WATER SYSTEMS

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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 H20 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 Marin 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

2.1 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.

2.2 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.

2.3 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.
- 2.4 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.
- 2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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

3.1 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.

3.2 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.

3.3 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.

3.4 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 setscrew flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the setscrew flange manufacturer.
 - 4. 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.
 - 5. 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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 of 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: 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 tope 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.

C. 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

01/23/20

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 International).

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 - Submittals

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 478-19 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(2019)e1, Grade 60-40-18.
 - 3. Steel Castings: Meet the requirements of ASTM A 27-19 for mild to medium strength castings and ASTM A 148-19 for high strength castings.
- C. Fabricated Steel Gratings and Frames: Fabricate from steel meeting the requirements of ASTM A 36-19 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 1/4-inch 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 CalTrans Specifications.
- 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 day's 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.
- B. 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 – Trenching and Backfilling.

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 – Trenching and Backfilling.

END OF SECTION

01/23/20